



1. Description

1.1. Project

| | |
|-----------------|--------------------------------|
| Project Name | weact_bluepillplus_stm32f103cb |
| Board Name | custom |
| Generated with: | STM32CubeMX 6.15.0 |
| Date | 08/08/2025 |

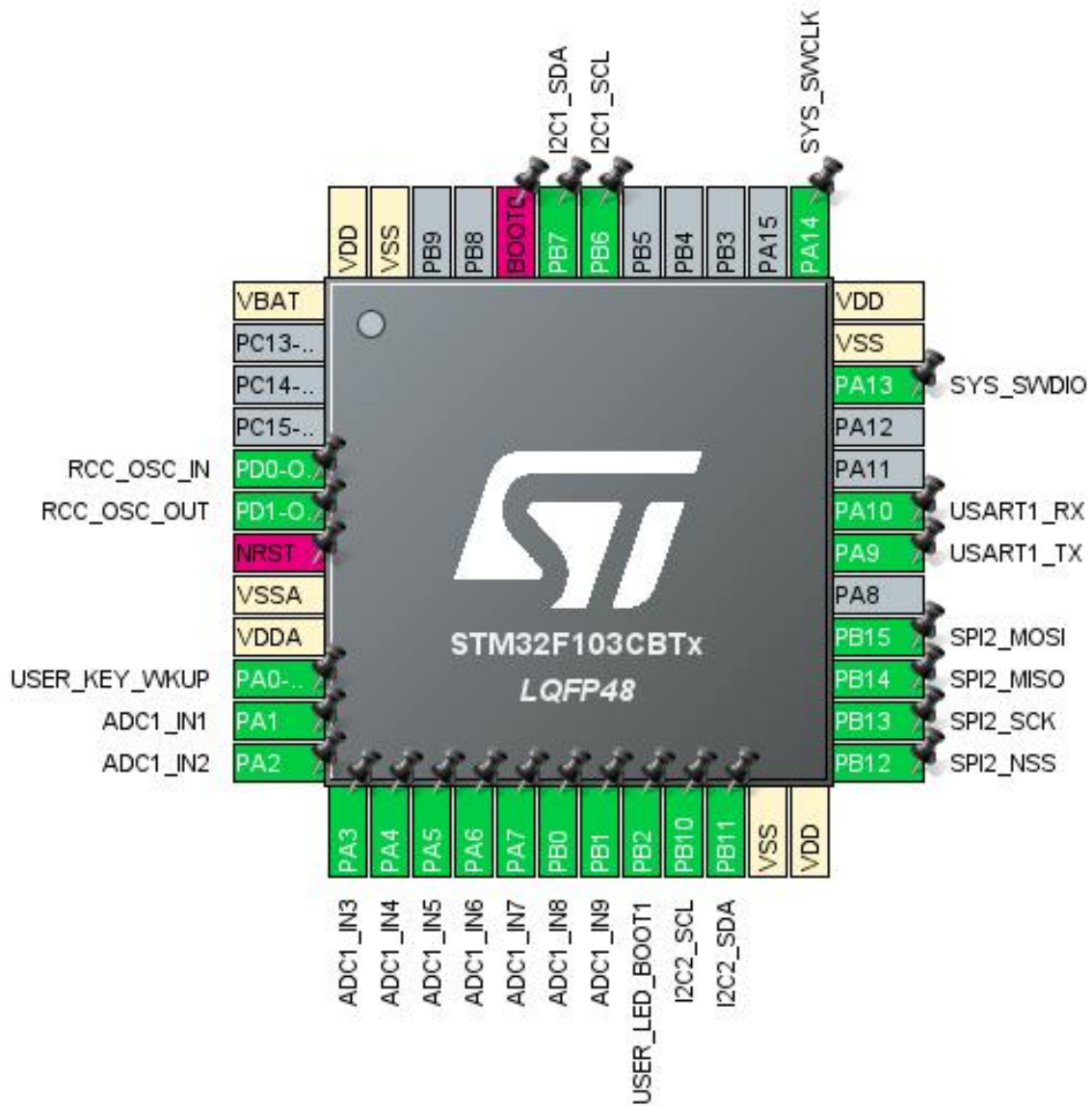
1.2. MCU

| | |
|----------------|---------------|
| MCU Series | STM32F1 |
| MCU Line | STM32F103 |
| MCU name | STM32F103CBTx |
| MCU Package | LQFP48 |
| MCU Pin number | 48 |

1.3. Core(s) information

| | |
|---------|---------------|
| Core(s) | Arm Cortex-M3 |
|---------|---------------|

2. Pinout Configuration

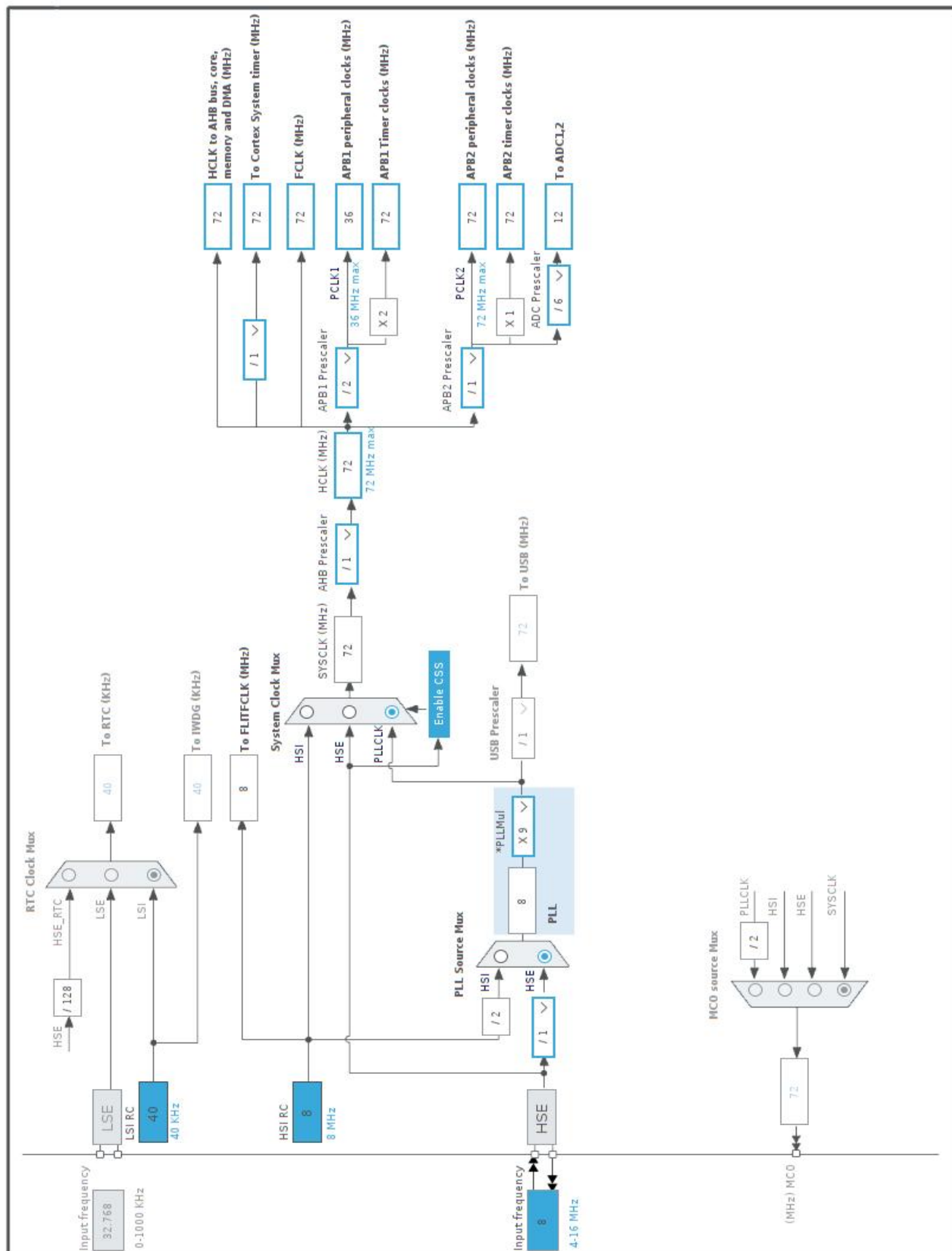


3. Pins Configuration

| Pin Number LQFP48 | Pin Name (function after reset) | Pin Type | Alternate Function(s) | Label |
|----------------------|---------------------------------------|----------|--------------------------|----------------|
| 1 | VBAT | Power | | |
| 5 | PD0-OSC_IN | I/O | RCC_OSC_IN | |
| 6 | PD1-OSC_OUT | I/O | RCC_OSC_OUT | |
| 7 | NRST | Reset | | |
| 8 | VSSA | Power | | |
| 9 | VDDA | Power | | |
| 10 | PA0-WKUP * | I/O | GPIO_Input | USER_KEY_WKUP |
| 11 | PA1 | I/O | ADC1_IN1 | |
| 12 | PA2 | I/O | ADC1_IN2 | |
| 13 | PA3 | I/O | ADC1_IN3 | |
| 14 | PA4 | I/O | ADC1_IN4 | |
| 15 | PA5 | I/O | ADC1_IN5 | |
| 16 | PA6 | I/O | ADC1_IN6 | |
| 17 | PA7 | I/O | ADC1_IN7 | |
| 18 | PB0 | I/O | ADC1_IN8 | |
| 19 | PB1 | I/O | ADC1_IN9 | |
| 20 | PB2 * | I/O | GPIO_Output | USER_LED_BOOT1 |
| 21 | PB10 | I/O | I2C2_SCL | |
| 22 | PB11 | I/O | I2C2_SDA | |
| 23 | VSS | Power | | |
| 24 | VDD | Power | | |
| 25 | PB12 | I/O | SPI2_NSS | |
| 26 | PB13 | I/O | SPI2_SCK | |
| 27 | PB14 | I/O | SPI2_MISO | |
| 28 | PB15 | I/O | SPI2_MOSI | |
| 30 | PA9 | I/O | USART1_TX | |
| 31 | PA10 | I/O | USART1_RX | |
| 34 | PA13 | I/O | SYS_JTMS-SWDIO | SYS_SWDIO |
| 35 | VSS | Power | | |
| 36 | VDD | Power | | |
| 37 | PA14 | I/O | SYS_JTCK-SWCLK | SYS_SWCLK |
| 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



1. Power Consumption Calculator report

1.1. Microcontroller Selection

| | |
|-----------|---------------|
| Series | STM32F1 |
| Line | STM32F103 |
| MCU | STM32F103CBTx |
| Datasheet | DS5319_Rev17 |

1.2. Parameter Selection

| | |
|-------------|-----|
| Temperature | 25 |
| Vdd | 3.3 |

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 |

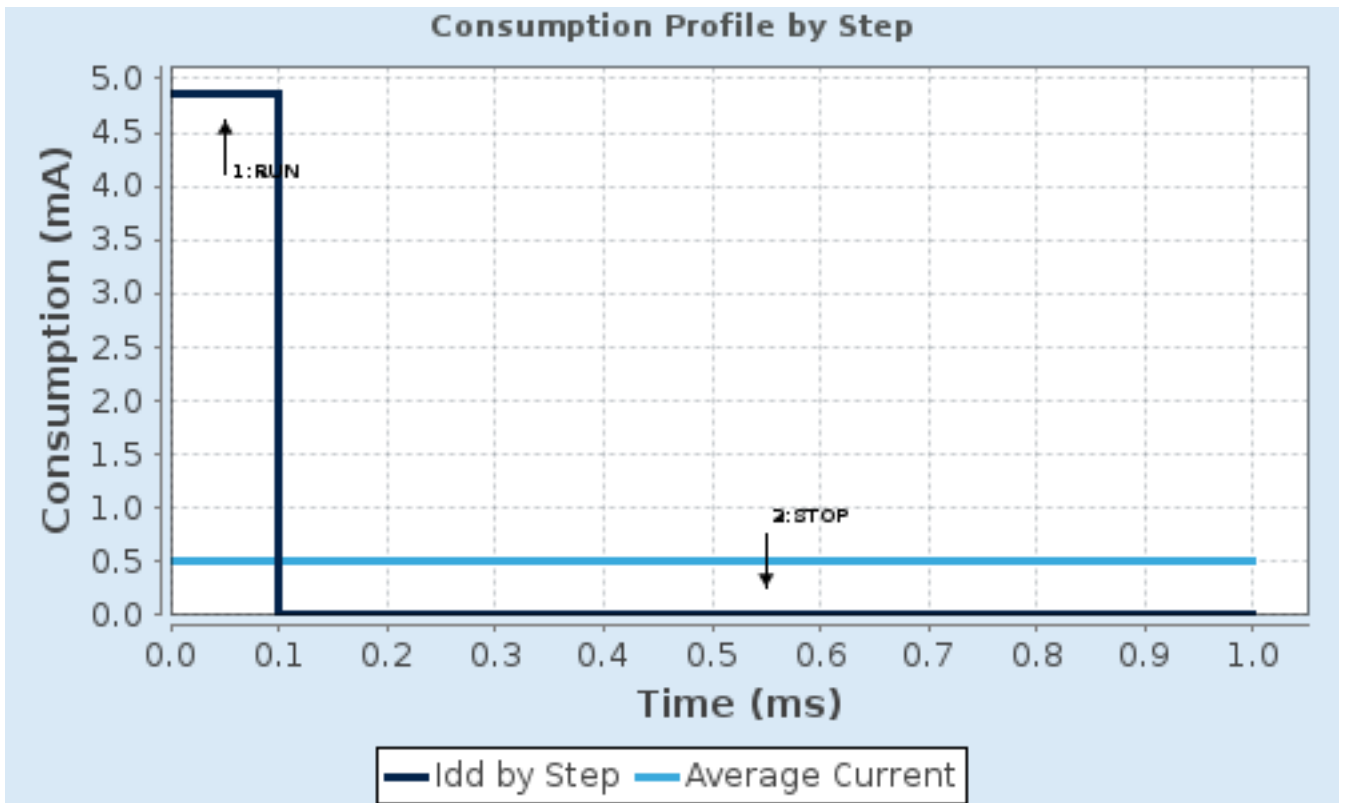
1.4. Sequence

| | | |
|-------------------------------|--|--------------|
| Step | Step1 | Step2 |
| Mode | RUN | STOP |
| Vdd | 3.3 | 3.3 |
| Voltage Source | Battery | Battery |
| Range | No Scale | No Scale |
| Fetch Type | FLASH | n/a |
| CPU Frequency | 8 MHz | 0 Hz |
| Clock Configuration | HSI | Regulator LP |
| Clock Source Frequency | 8 MHz | 0 Hz |
| Peripherals | ADC1 APB1-Bridge APB2-Bridge GPIOA GPIOB GPIOD I2C1 I2C2 SPI2 USART1 | |
| Additional Cons. | 0 mA | 0 mA |
| Average Current | 4.86 mA | 14 μ A |
| Duration | 0.1 ms | 0.9 ms |
| DMIPS | 10.0 | 0.0 |
| Ta Max | 104.12 | 105 |
| Category | In DS Table | In DS Table |

1.5. Results

| | | | |
|---------------|---------------------------|-----------------|---------------|
| Sequence Time | 1 ms | Average Current | 498.6 μ A |
| Battery Life | 9 months, 8 days, 5 hours | Average DMIPS | 10.0 DMIPS |

1.6. Chart



2. Software Project

2.1. Project Settings

| Name | Value |
|-----------------------------------|--|
| Project Name | weact_bluepillplus_stm32f103cb |
| Project Folder | /store/EmbedTools/STM32CubeMX/weact_bluepillplus/weact_bluepillplus_stm32f |
| Toolchain / IDE | CMake |
| Firmware Package Name and Version | STM32Cube FW_F1 V1.8.6 |
| Application Structure | Advanced |
| Generate Under Root | No |
| 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 | Copy all used libraries into the project folder |
| Generate peripheral initialization as a pair of '.c/.h' files | No |
| Backup previously generated files when re-generating | Yes |
| 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 | Yes |

2.3. Advanced Settings - Generated Function Calls

| Rank | Function Name | Peripheral Instance Name |
|------|---------------------|--------------------------|
| 1 | SystemClock_Config | RCC |
| 2 | MX_GPIO_Init | GPIO |
| 3 | MX_USART1_UART_Init | USART1 |
| 4 | MX_ADC1_Init | ADC1 |
| 5 | MX_I2C1_Init | I2C1 |
| 6 | MX_I2C2_Init | I2C2 |
| 7 | MX_SPI2_Init | SPI2 |

3. Peripherals and Middlewares Configuration

3.1. ADC1

mode: IN1

mode: IN2

mode: IN3

mode: IN4

mode: IN5

mode: IN6

mode: IN7

mode: IN8

mode: IN9

mode: Temperature Sensor Channel

mode: Vrefint Channel

3.1.1. Parameter Settings:

ADCs_Common_Settings:

Mode Independent mode

ADC_Settings:

Data Alignment Right alignment

Scan Conversion Mode Disabled

Continuous Conversion Mode Disabled

Discontinuous Conversion Mode Disabled

ADC_Regular_ConversionMode:

Enable Regular Conversions Enable

Number Of Conversion 1

External Trigger Conversion Source Regular Conversion launched by software

Rank 1

Channel Channel 1

Sampling Time 1.5 Cycles

ADC_Injected_ConversionMode:

Enable Injected Conversions Disable

WatchDog:

Enable Analog WatchDog Mode false

3.2. I2C1

I2C: I2C

3.2.1. Parameter Settings:

Master Features:

| | |
|----------------------|---------------------------|
| I2C Speed Mode | Fast Mode * |
| I2C Clock Speed (Hz) | 400000 |
| Fast Mode Duty Cycle | Duty cycle Tlow/Thigh = 2 |

Slave Features:

| | |
|----------------------------------|----------|
| Clock No Stretch Mode | Disabled |
| Primary Address Length selection | 7-bit |
| Dual Address Acknowledged | Disabled |
| Primary slave address | 0 |
| General Call address detection | Disabled |

3.3. I2C2

I2C: I2C

3.3.1. Parameter Settings:

Master Features:

| | |
|----------------------|---------------------------|
| I2C Speed Mode | Fast Mode * |
| I2C Clock Speed (Hz) | 400000 |
| Fast Mode Duty Cycle | Duty cycle Tlow/Thigh = 2 |

Slave Features:

| | |
|----------------------------------|----------|
| Clock No Stretch Mode | Disabled |
| Primary Address Length selection | 7-bit |
| Dual Address Acknowledged | Disabled |
| Primary slave address | 0 |
| General Call address detection | Disabled |

3.4. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

3.4.1. Parameter Settings:

System Parameters:

| | |
|-------------------|--------------------|
| VDD voltage (V) | 3.3 |
| Prefetch Buffer | Enabled |
| Flash Latency(WS) | 2 WS (3 CPU cycle) |

RCC Parameters:

| | |
|--------------------------------|------|
| HSI Calibration Value | 16 |
| HSE Startup Timeout Value (ms) | 100 |
| LSE Startup Timeout Value (ms) | 5000 |

3.5. SPI2

Mode: Full-Duplex Master

Hardware NSS Signal: Hardware NSS Output Signal

3.5.1. Parameter Settings:

Basic Parameters:

| | |
|--------------|------------------|
| Frame Format | Motorola |
| Data Size | 16 Bits * |
| First Bit | MSB First |

Clock Parameters:

| | |
|---------------------------|-----------------------|
| Prescaler (for Baud Rate) | 2 |
| Baud Rate | 18.0 MBits/s * |
| Clock Polarity (CPOL) | Low |
| Clock Phase (CPHA) | 1 Edge |

Advanced Parameters:

| | |
|-----------------|-----------------|
| CRC Calculation | Disabled |
| NSS Signal Type | Output Hardware |

3.6. SYS

Debug: Serial Wire

Timebase Source: SysTick

3.7. USART1

Mode: Asynchronous

3.7.1. 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

*** User modified value**

4. System Configuration

4.1. GPIO configuration

| IP | Pin | Signal | GPIO mode | GPIO pull/up pull down | Max Speed | User Label |
|--------|-------------|----------------|-------------------------------|-----------------------------|-----------|----------------|
| ADC1 | PA1 | ADC1_IN1 | Analog mode | n/a | n/a | |
| | PA2 | ADC1_IN2 | Analog mode | n/a | n/a | |
| | PA3 | ADC1_IN3 | Analog mode | n/a | n/a | |
| | PA4 | ADC1_IN4 | Analog mode | n/a | n/a | |
| | PA5 | ADC1_IN5 | Analog mode | n/a | n/a | |
| | PA6 | ADC1_IN6 | Analog mode | n/a | n/a | |
| | PA7 | ADC1_IN7 | Analog mode | n/a | n/a | |
| | PB0 | ADC1_IN8 | Analog mode | n/a | n/a | |
| | PB1 | ADC1_IN9 | Analog mode | n/a | n/a | |
| I2C1 | PB6 | I2C1_SCL | Alternate Function Open Drain | n/a | High * | |
| | PB7 | I2C1_SDA | Alternate Function Open Drain | n/a | High * | |
| I2C2 | PB10 | I2C2_SCL | Alternate Function Open Drain | n/a | High * | |
| | PB11 | I2C2_SDA | Alternate Function Open Drain | n/a | High * | |
| RCC | PD0-OSC_IN | RCC_OSC_IN | n/a | n/a | n/a | |
| | PD1-OSC_OUT | RCC_OSC_OUT | n/a | n/a | n/a | |
| SPI2 | PB12 | SPI2_NSS | Alternate Function Push Pull | n/a | High * | |
| | PB13 | SPI2_SCK | Alternate Function Push Pull | n/a | High * | |
| | PB14 | SPI2_MISO | Input mode | No pull-up and no pull-down | n/a | |
| | PB15 | SPI2_MOSI | Alternate Function Push Pull | n/a | High * | |
| SYS | PA13 | SYS_JTMS-SWDIO | n/a | n/a | n/a | SYS_SWDIO |
| | PA14 | SYS_JTCK-SWCLK | n/a | n/a | n/a | SYS_SWCLK |
| USART1 | PA9 | USART1_TX | Alternate Function Push Pull | n/a | High * | |
| | PA10 | USART1_RX | Input mode | No pull-up and no pull-down | n/a | |
| GPIO | PA0-WKUP | GPIO_Input | Input mode | Pull-down * | n/a | USER_KEY_WKUP |
| | PB2 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | USER_LED_BOOT1 |

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 |
| 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 |
| RCC global interrupt | true | 0 | 0 |
| ADC1 and ADC2 global interrupts | true | 0 | 0 |
| I2C1 event interrupt | true | 0 | 0 |
| I2C1 error interrupt | true | 0 | 0 |
| I2C2 event interrupt | true | 0 | 0 |
| I2C2 error interrupt | true | 0 | 0 |
| SPI2 global interrupt | true | 0 | 0 |
| USART1 global interrupt | true | 0 | 0 |
| PVD interrupt through EXTI line 16 | unused | | |
| Flash global 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 |
| 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 |
| RCC global interrupt | false | true | false |
| ADC1 and ADC2 global interrupts | false | true | true |
| I2C1 event interrupt | false | true | true |
| I2C1 error interrupt | false | true | true |
| I2C2 event interrupt | false | true | true |

| Enabled interrupt Table | Select for init sequence ordering | Generate IRQ handler | Call HAL handler |
|-------------------------|--------------------------------------|-------------------------|------------------|
| I2C2 error interrupt | false | true | true |
| SPI2 global interrupt | false | true | true |
| USART1 global interrupt | false | true | true |

* User modified value

5. System Views

5.1. Category view

5.1.1. Current

6. Docs & Resources

| Type | Link |
|-------------------------|---|
| BSDL files | https://www.st.com/resource/en/bsdl_model/stm32f1_bsdl.zip |
| IBIS models | https://www.st.com/resource/en/ibis_model/stm32f1-ibis.zip |
| System View Description | https://www.st.com/resource/en/svd/stm32f1_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_functional-safety-packages.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/flstm32nucleo.pdf |
| Flyers | https://www.st.com/resource/en/flyer/fldpstpf11120.pdf |
| Product Certifications | https://www.st.com/resource/en/certification_document/1239988349.pdf |
| Product Certifications | https://www.st.com/resource/en/certification_document/stm32_authentication_can.pdf |
| Security Bulletin | https://www.st.com/resource/en/technical_note/tn1489-security-bulletin-tn1489stpsirt-physical-attacks-on-stm32-and-stm32cube-firmware-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/an2586-getting-started-with-stm32f10xxx-hardware-development-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/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/an3095-stevalisv002v1-stevalisv002v2-3-kw-gridconnected-pv-system-based-on-the-stm32f103xx-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an3108-stlm75-firmware-library-for-the-stm32f10x-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/an3128-stm32-embedded-graphic-objectstouchscreen-library-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/an3364-migration-and-compatibility-guidelines-for-stm32-microcontroller-applications-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an3422-migration-of-microcontroller-applications-from-stm32f1-to-stm32l1-series-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an3427-migrating-a-microcontroller-application-from-stm32f1-to-stm32f2-series-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an3429-stm32-proprietary-code-protection-overview-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an3970-plm-smartplug-v2-getting-started-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4068-st7580-power-line-communication-systemonchip-design-guide-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4070-250-w-grid-connected-microinverter-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4076-two-or-three-shunt-resistor-based-current-sensing-circuit-design-in-3phase-inverters-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/an4228-migrating-from-stm32f1-series-to-stm32f3-series-microcontrollers-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4649-migrating-from-stm32f1-series-to-stm32l4-series--stm32l4-series-microntrollers-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/an4724-stm32cube-firmware-examples-for-stm32f1-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/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/an4904-migration-of-microcontroller-applications-from-stm32f1-series-to-stm32f4-access-lines-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/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/an4838-introduction-to-memory-protection-unit-management-on-stm32-mcus-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4879-introduction-to-usb-hardware-and-pcb-guidelines-using-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/an5537-how-to-use-adc-oversampling-techniques-to-improve-signaltonoise-ratio-on-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/an4908-getting-started-with-uart-automatic-baud-rater-detection-for-stm32-mcus-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an5156-introduction-to-

security-for-stm32-mcus-stmicroelectronics.pdf

- Application Notes https://www.st.com/resource/en/application_note/an5543-guidelines-for-enhanced-spi-communication-on-stm32-mcus-and-mpus-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/cd00211314-how-to-optimize-the-adc-accuracy-in-the-stm32-mcus-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an2639-soldering-recommendations-and-package-information-for-leadfree-ecopack2-mcus-and-mpus-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an3154-how-to-use-can-protocol-in-bootloader-on-stm32-mcus-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4566-how-to-extend-the-dac-performance-on-stm32-mcus-stmicroelectronics.pdf
- Application Notes [https://www.st.com/resource/en/application_note/an2557-stm32f10x-for related Tools & Software inapplication-programming-using-the-usart-stmicroelectronics.pdf](https://www.st.com/resource/en/application_note/an2557-stm32f10x-for-related-Tools-&Software-inapplication-programming-using-the-usart-stmicroelectronics.pdf)
- Application Notes [https://www.st.com/resource/en/application_note/an2592-achieving-32bit-for related Tools & Software timer-resolution-with-software-expansion-for-stm32cube-and-standard-peripheral-library-stmicroelectronics.pdf](https://www.st.com/resource/en/application_note/an2592-achieving-32bit-for-related-Tools-&Software-timer-resolution-with-software-expansion-for-stm32cube-and-standard-peripheral-library-stmicroelectronics.pdf)
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