



1. Description

1.1. Project

| | |
|-----------------|--------------------|
| Project Name | trabalho-arm |
| Board Name | custom |
| Generated with: | STM32CubeMX 6.12.0 |
| Date | 08/07/2024 |

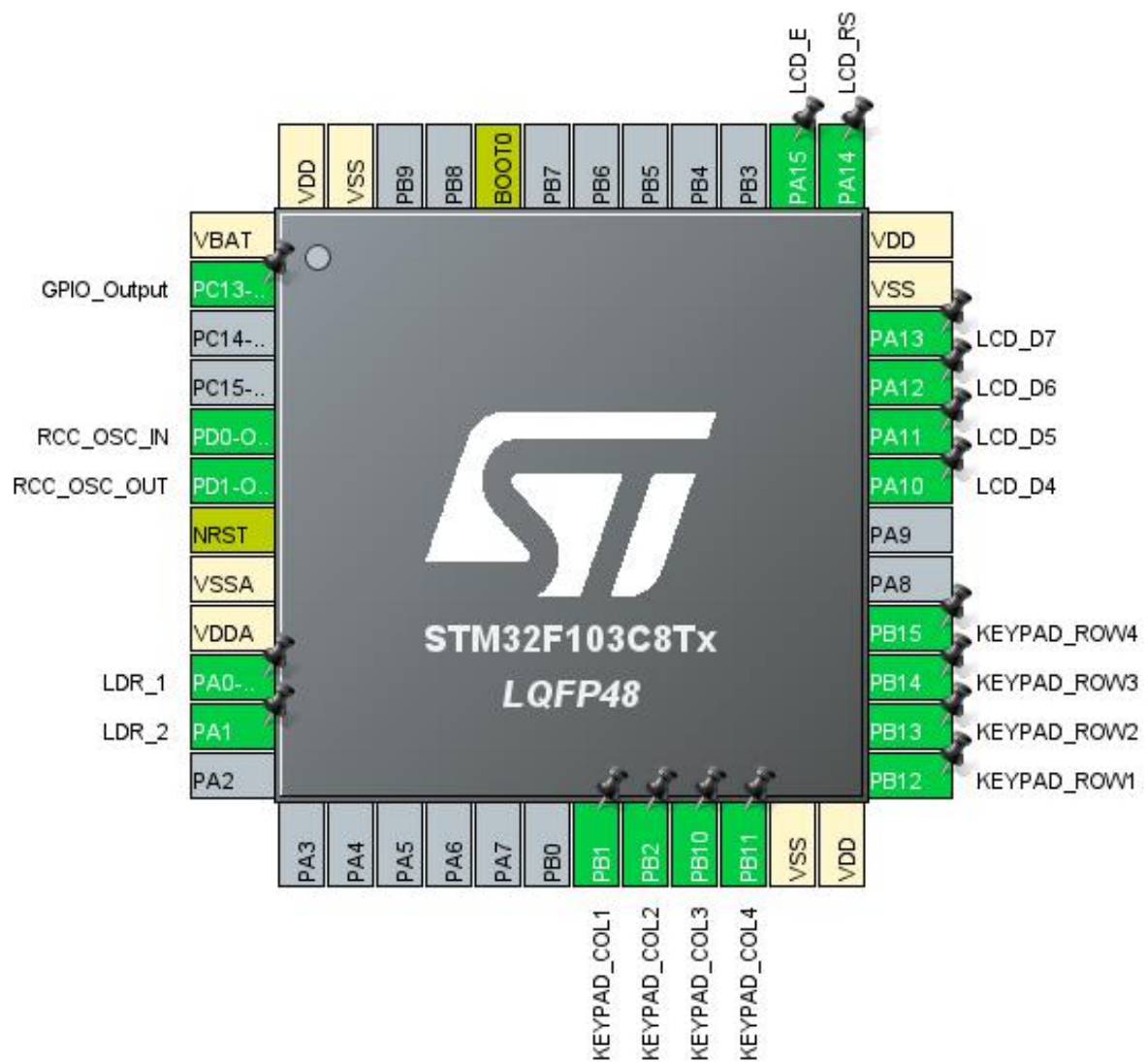
1.2. MCU

| | |
|----------------|---------------|
| MCU Series | STM32F1 |
| MCU Line | STM32F103 |
| MCU name | STM32F103C8Tx |
| MCU Package | LQFP48 |
| MCU Pin number | 48 |

1.3. Core(s) information

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

2. Pinout Configuration

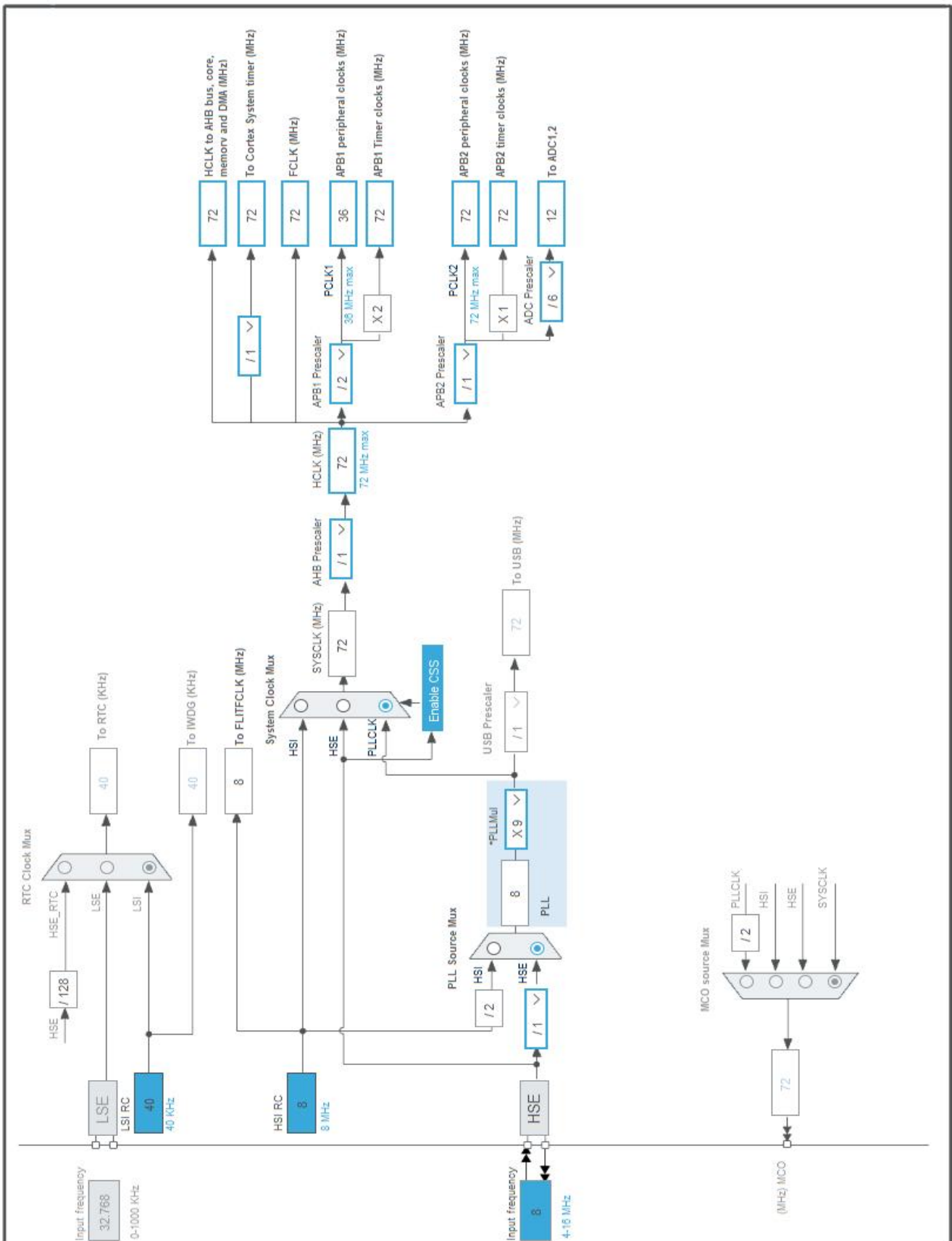


3. Pins Configuration

| Pin Number LQFP48 | Pin Name (function after reset) | Pin Type | Alternate Function(s) | Label |
|----------------------|---------------------------------------|----------|--------------------------|-------------|
| 1 | VBAT | Power | | |
| 2 | PC13-TAMPER-RTC * | I/O | GPIO_Output | |
| 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 | ADC1_IN0 | LDR_1 |
| 11 | PA1 | I/O | ADC1_IN1 | LDR_2 |
| 19 | PB1 * | I/O | GPIO_Output | KEYPAD_COL1 |
| 20 | PB2 * | I/O | GPIO_Output | KEYPAD_COL2 |
| 21 | PB10 * | I/O | GPIO_Output | KEYPAD_COL3 |
| 22 | PB11 * | I/O | GPIO_Output | KEYPAD_COL4 |
| 23 | VSS | Power | | |
| 24 | VDD | Power | | |
| 25 | PB12 * | I/O | GPIO_Input | KEYPAD_ROW1 |
| 26 | PB13 * | I/O | GPIO_Input | KEYPAD_ROW2 |
| 27 | PB14 * | I/O | GPIO_Input | KEYPAD_ROW3 |
| 28 | PB15 * | I/O | GPIO_Input | KEYPAD_ROW4 |
| 31 | PA10 * | I/O | GPIO_Output | LCD_D4 |
| 32 | PA11 * | I/O | GPIO_Output | LCD_D5 |
| 33 | PA12 * | I/O | GPIO_Output | LCD_D6 |
| 34 | PA13 * | I/O | GPIO_Output | LCD_D7 |
| 35 | VSS | Power | | |
| 36 | VDD | Power | | |
| 37 | PA14 * | I/O | GPIO_Output | LCD_RS |
| 38 | PA15 * | I/O | GPIO_Output | LCD_E |
| 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 | STM32F103C8Tx |
| 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 |

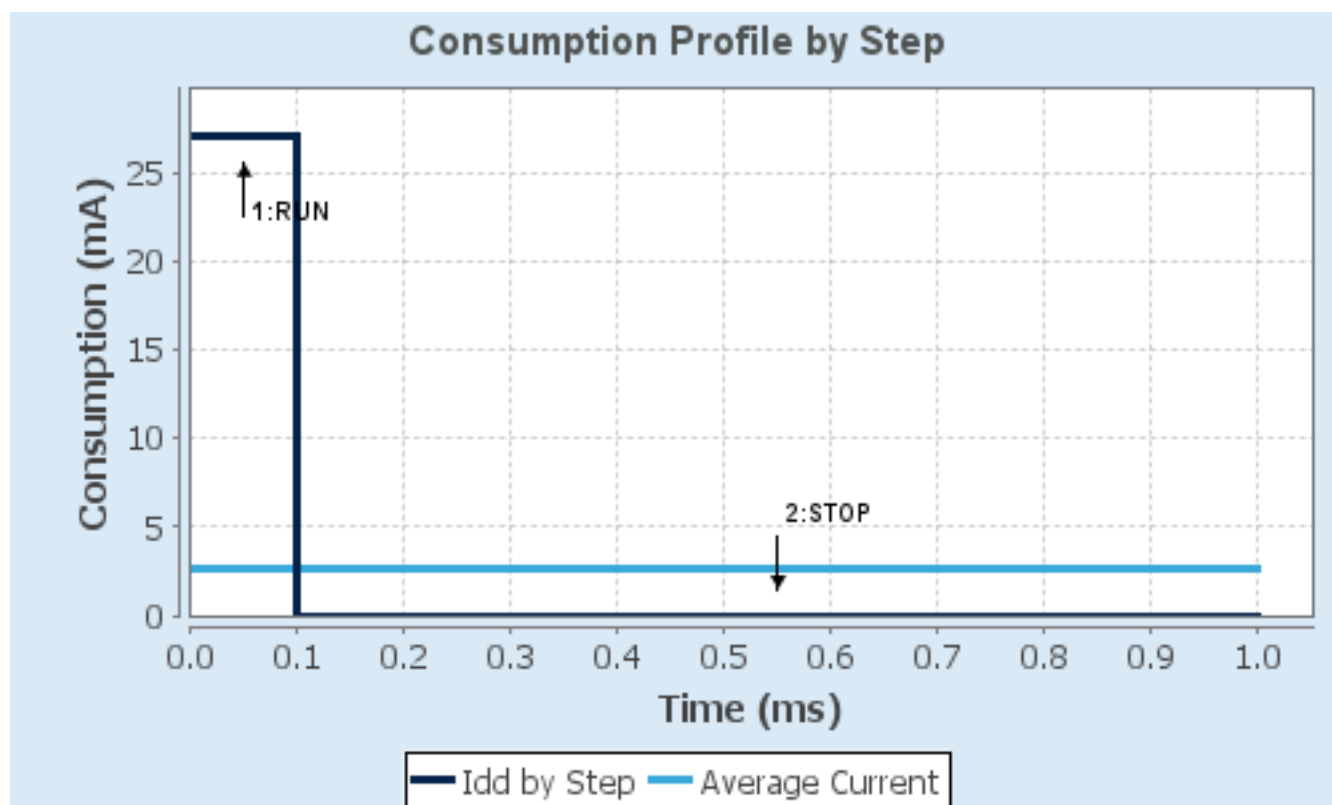
1.4. Sequence

| | | |
|-------------------------------|-------------|--------------|
| 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 | 72 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 | 27 mA | 14 μ A |
| Duration | 0.1 ms | 0.9 ms |
| DMIPS | 90.0 | 0.0 |
| Ta Max | 100.1 | 105 |
| Category | In DS Table | In DS Table |

1.5. Results

| | | | |
|---------------|-------------------------------|-----------------|------------|
| Sequence Time | 1 ms | Average Current | 2.71 mA |
| Battery Life | 1 month, 21 days, 17 hours | Average DMIPS | 61.0 DMIPS |

1.6. Chart



2. Software Project

2.1. Project Settings

| Name | Value |
|-----------------------------------|--|
| Project Name | trabalho-arm |
| Project Folder | C:\Users\arthur\Documents\RealDocuments\UFRGS\Microprocessadores\micropr |
| Toolchain / IDE | STM32CubeIDE |
| Firmware Package Name and Version | STM32Cube FW_F1 V1.8.5 |
| 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 | 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 |

2.3. Advanced Settings - Generated Function Calls

| Rank | Function Name | Peripheral Instance Name |
|------|--------------------|--------------------------|
| 1 | SystemClock_Config | RCC |
| 2 | MX_GPIO_Init | GPIO |
| 3 | MX_ADC1_Init | ADC1 |
| 4 | MX_TIM1_Init | TIM1 |

3. Peripherals and Middlewares Configuration

3.1. ADC1

mode: IN0

mode: IN1

3.1.1. Parameter Settings:

ADCs_Common_Settings:

Mode Independent mode

ADC_Settings:

Data Alignment Right alignment

Scan Conversion Mode Disabled

Continuous Conversion Mode **Enabled ***

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 0

Sampling Time 1.5 Cycles

ADC_Injected_ConversionMode:

Enable Injected Conversions Disable

WatchDog:

Enable Analog WatchDog Mode false

3.2. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

3.2.1. 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

3.3. SYS

Debug: No Debug

Timebase Source: SysTick

3.4. TIM1

Trigger Source: ITR0

Clock Source : Internal Clock

3.4.1. Parameter Settings:

Counter Settings:

| | |
|---|--------------------|
| Prescaler (PSC - 16 bits value) | 0 |
| Counter Mode | Up |
| Counter Period (AutoReload Register - 16 bits value) | 65535 |
| Internal Clock Division (CKD) | No Division |
| Repetition Counter (RCR - 8 bits value) | 0 |
| auto-reload preload | Disable |
| Slave Mode Controller | Slave mode 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) |

*** 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 | PA0-WKUP | ADC1_IN0 | Analog mode | n/a | n/a | LDR_1 |
| | PA1 | ADC1_IN1 | Analog mode | n/a | n/a | LDR_2 |
| 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 | |
| GPIO | PC13-TAMPER-RTC | GPIO_Output | Output Push Pull | No pull-up and no pull-down | High * | |
| | PB1 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | High * | KEYPAD_COL1 |
| | PB2 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | High * | KEYPAD_COL2 |
| | PB10 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | High * | KEYPAD_COL3 |
| | PB11 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | High * | KEYPAD_COL4 |
| | PB12 | GPIO_Input | Input mode | No pull-up and no pull-down | n/a | KEYPAD_ROW1 |
| | PB13 | GPIO_Input | Input mode | No pull-up and no pull-down | n/a | KEYPAD_ROW2 |
| | PB14 | GPIO_Input | Input mode | No pull-up and no pull-down | n/a | KEYPAD_ROW3 |
| | PB15 | GPIO_Input | Input mode | No pull-up and no pull-down | n/a | KEYPAD_ROW4 |
| | PA10 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | High * | LCD_D4 |
| | PA11 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | High * | LCD_D5 |
| | PA12 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | High * | LCD_D6 |
| | PA13 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | High * | LCD_D7 |
| | PA14 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | LCD_RS |
| | PA15 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | LCD_E |

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 |
| PVD interrupt through EXTI line 16 | unused | | |
| Flash global interrupt | unused | | |
| RCC global interrupt | unused | | |
| ADC1 and ADC2 global interrupts | unused | | |
| TIM1 break interrupt | unused | | |
| TIM1 update interrupt | unused | | |
| TIM1 trigger and commutation interrupts | unused | | |
| TIM1 capture compare 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 |

* User modified value

5. System Views

5.1. Category view

5.1.1. Current

Middleware

System Core

Analog

Timers

Connectivity

Computing

DMA

ADC1 

TIM1 

GPIO 

IVIC 

RCC 

SYS 

6. Docs & Resources

| Type | Link |
|-------------------------|---|
| BSDL files | https://www.st.com/resource/en/bsdl_model/stm32f1_bsd1.zip |
| IBIS models | https://www.st.com/resource/en/ibis_model/stm32ibis.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/flstmcsuite.pdf |
| Flyers | https://www.st.com/resource/en/flyer/fldpstpfc11120.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 |
| 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/an2604-stm32f101xx-and-stm32f103xx-rtc-calibration-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/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/an3154-can-protocol-used-in-the-stm32-bootloader-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/an3961-stevalime003v1-demonstration-board-based-on-the-sthv748-ultrasound-pulser-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/an4229-how-to-implement-a-vocoder-solution-using-stm32-microcontrollers-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/an4649-migrating-from-stm32f1-series-to-stm32l4-series--stm32l4-series-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/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
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- Application Notes https://www.st.com/resource/en/application_note/an4899-stm32-microcontroller-gpio-hardware-settings-and-lowpower-consumption-stmicroelectronics.pdf
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- Application Notes https://www.st.com/resource/en/application_note/an2834-how-to-optimize-the-adc-accuracy-in-the-stm32-mcus-stmicroelectronics.pdf
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- 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-rate-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

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& Software

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& Software

Application Notes https://www.st.com/resource/en/application_note/an1801_stm32cubeprog_for_related_Tools_rammer_in_truestudio-installing-stm32cubeprogrammer-in-truestudio-stmicroelectronics.pdf
& 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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for related Tools inapplication-programming-using-the-usart-stmicroelectronics.pdf
& Software

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for related Tools timer-resolution-with-software-expansion-for-stm32cube-and-standard-peripheral-library-stmicroelectronics.pdf
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for related Tools interface-with-stm32f10x-and-stm32l1xx-microcontrollers-stmicroelectronics.pdf
& Software

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for related Tools stm32f102xx-and-stm32f103xx-lowpower-modes-stmicroelectronics.pdf
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for related Tools lcd-glass-driver-firmware-stmicroelectronics.pdf
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