# 1. Description

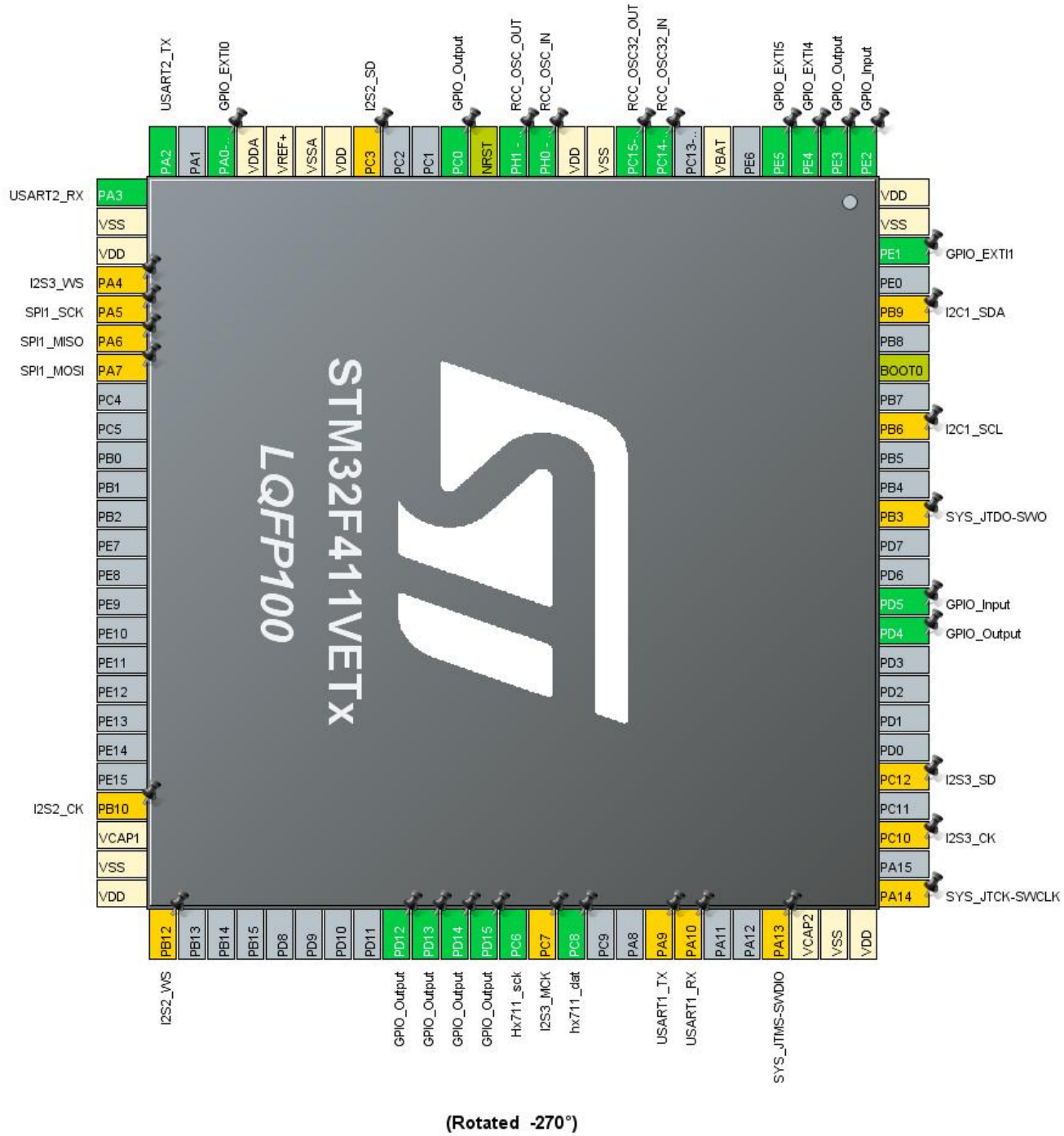
## 1.1. Project

| | |
|---|---|
| Project Name | Blinky |
| Board Name | STM32F411E-DISCO |
| Generated with: | STM32CubeMX 5.6.1 |
| Date | 11/19/2022 |

## 1.2. MCU

| | |
|---|---|
| MCU Series | STM32F4 |
| MCU Line | STM32F411 |
| MCU name | STM32F411VETx |
| MCU Package | LQFP100 |
| MCU Pin number | 100 |

## 2. Pinout Configuration




**(Rotated -270°)**

## 3. Pins Configuration

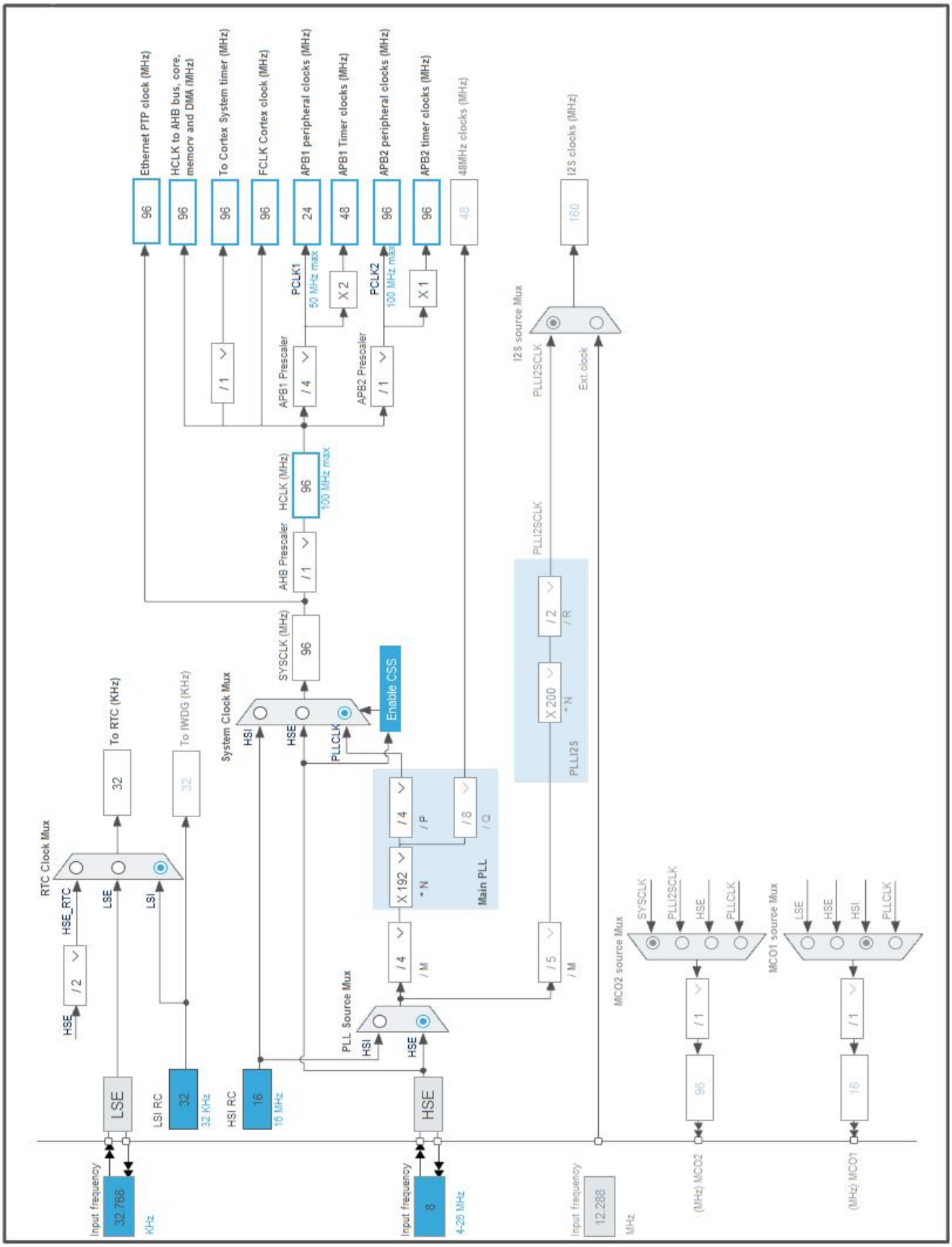
| Pin Number LQFP100 | Pin Name (function after reset) | Pin Type | Alternate Function(s) | Label |
|---|---|---|---|---|
| 1 | PE2 * | I/O | GPIO_Input | |
| 2 | PE3 * | I/O | GPIO_Output | |
| 3 | PE4 | I/O | GPIO_EXTI4 | |
| 4 | PE5 | I/O | GPIO_EXTI5 | |
| 6 | VBAT | Power | | |
| 8 | PC14-OSC32_IN | I/O | RCC_OSC32_IN | |
| 9 | PC15-OSC32_OUT | I/O | RCC_OSC32_OUT | |
| 10 | VSS | Power | | |
| 11 | VDD | Power | | |
| 12 | PH0 - OSC_IN | I/O | RCC_OSC_IN | |
| 13 | PH1 - OSC_OUT | I/O | RCC_OSC_OUT | |
| 14 | NRST | Reset | | |
| 15 | PC0 * | I/O | GPIO_Output | |
| 18 | PC3 ** | I/O | I2S2_SD | |
| 19 | VDD | Power | | |
| 20 | VSSA | Power | | |
| 21 | VREF+ | Power | | |
| 22 | VDDA | Power | | |
| 23 | PA0-WKUP | I/O | GPIO_EXTI0 | |
| 25 | PA2 | I/O | USART2_TX | |
| 26 | PA3 | I/O | USART2_RX | |
| 27 | VSS | Power | | |
| 28 | VDD | Power | | |
| 29 | PA4 ** | I/O | I2S3_WS | |
| 30 | PA5 ** | I/O | SPI1_SCK | |
| 31 | PA6 ** | I/O | SPI1_MISO | |
| 32 | PA7 ** | I/O | SPI1_MOSI | |
| 47 | PB10 ** | I/O | I2S2_CK | |
| 48 | VCAP1 | Power | | |
| 49 | VSS | Power | | |
| 50 | VDD | Power | | |
| 51 | PB12 ** | I/O | I2S2_WS | |
| 59 | PD12 * | I/O | GPIO_Output | |
| 60 | PD13 * | I/O | GPIO_Output | |
| 61 | PD14 * | I/O | GPIO_Output | |
| 62 | PD15 * | I/O | GPIO_Output | |

| Pin Number LQFP100 | Pin Name (function after reset) | Pin Type | Alternate Function(s) | Label |
|---|---|---|---|---|
| 63 | PC6 | I/O | TIM3_CH1 | Hx711_sck |
| 64 | PC7 ** | I/O | I2S3_MCK | |
| 65 | PC8 * | I/O | GPIO_Input | hx711_dat |
| 68 | PA9 ** | I/O | USART1_TX | |
| 69 | PA10 ** | I/O | USART1_RX | |
| 72 | PA13 ** | I/O | SYS_JTMS-SWDIO | |
| 73 | VCAP2 | Power | | |
| 74 | VSS | Power | | |
| 75 | VDD | Power | | |
| 76 | PA14 ** | I/O | SYS_JTCK-SWCLK | |
| 78 | PC10 ** | I/O | I2S3_CK | |
| 80 | PC12 ** | I/O | I2S3_SD | |
| 85 | PD4 * | I/O | GPIO_Output | |
| 86 | PD5 * | I/O | GPIO_Input | |
| 89 | PB3 ** | I/O | SYS_JTDO-SWO | |
| 92 | PB6 ** | I/O | I2C1_SCL | |
| 94 | BOOT0 | Boot | | |
| 96 | PB9 ** | I/O | I2C1_SDA | |
| 98 | PE1 | I/O | GPIO_EXTI1 | |
| 99 | VSS | Power | | |
| 100 | VDD | Power | | |

* The pin is affected with an I/O function

** The pin is affected with a peripheral function but no peripheral mode is activated

# 4. Clock Tree Configuration



# 5. Software Project

## 5.1. Project Settings

| Name | Value |
|---|---|
| Project Name | Blinky |
| Project Folder | C:\Users\keichers\Documents\Making Embedded Systems Class\Code\Blinky |
| Toolchain / IDE | EWARM V8.32 |
| Firmware Package Name and Version | STM32Cube FW_F4 V1.25.2 |

## 5.2. 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 | No |
| Delete previously generated files when not re-generated | Yes |
| Set all free pins as analog (to optimize the power consumption) | No |

# 6. Power Consumption Calculator report

6.1. Microcontroller Selection

| | |
|---|---|
| Series | STM32F4 |
| Line | STM32F411 |
| MCU | STM32F411VETx |
| Datasheet | 026289_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 |

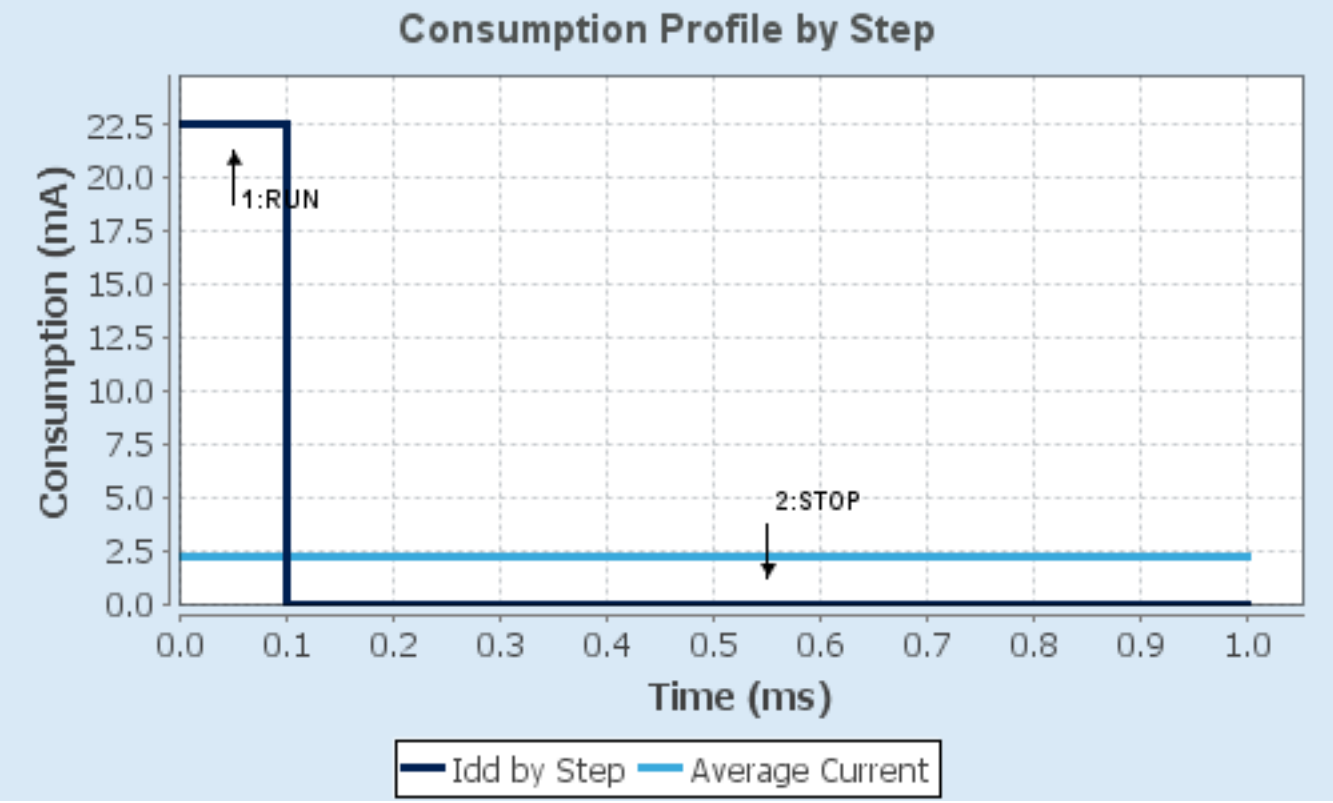
6.4. Sequence

| ***Step*** | Step1 | Step2 |
|---|---|---|
| ***Mode*** | RUN | STOP |
| ***Vdd*** | 3.6 | 3.6 |
| ***Voltage Source*** | Battery | Battery |
| ***Range*** | Scale1-High | No Scale |
| ***Fetch Type*** | FLASH/ART/PREFETCH | n/a |
| ***CPU Frequency*** | 100 MHz | 0 Hz |
| ***Clock Configuration*** | HSE PLL | Regulator_LPLV Flash-PwrDwn |
| ***Clock Source Frequency*** | 4 MHz | 0 Hz |
| ***Peripherals*** | | |
| ***Additional Cons.*** | 0 mA | 0 mA |
| ***Average Current*** | 22.5 mA | 10 µA |
| ***Duration*** | 0.1 ms | 0.9 ms |
| ***DMIPS*** | 125.0 | 0.0 |
| ***Ta Max*** | 101.52 | 105 |
| ***Category*** | In DS Table | In DS Table |

## 6.5. RESULTS

| Sequence Time | 1 ms | Average Current | 2.26 mA |
|---|---|---|---|
| Battery Life | 2 months, 1 day, 18 hours | Average DMIPS | 125.0 DMIPS |

## 6.6. Chart


Consumption Profile by Step
Consumption (mA)
22.5
20.0
17.5
15.0
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. IPs and Middleware Configuration

## 7.1. GPIO

## 7.2. RCC

**High Speed Clock (HSE): Crystal/Ceramic Resonator**

**Low Speed Clock (LSE) : Crystal/Ceramic Resonator**

### 7.2.1. Parameter Settings:

**System Parameters:**

| | |
|---|---|
| VDD voltage (V) | 3.3 |
| Instruction Cache | Enabled |
| Prefetch Buffer | Enabled |
| Data Cache | Enabled |
| Flash Latency(WS) | 3 WS (4 CPU cycle) |

**RCC Parameters:**

| | |
|---|---|
| HSI Calibration Value | 16 |
| TIM Prescaler Selection | Disabled |
| HSE Startup Timout Value (ms) | 100 |
| LSE Startup Timout Value (ms) | 5000 |

**Power Parameters:**

| | |
|---|---|
| Power Regulator Voltage Scale | Power Regulator Voltage Scale 1 |

## 7.3. RTC

**mode: Activate Clock Source**

### 7.3.1. Parameter Settings:

**General:**

| | |
|---|---|
| Hour Format | Hourformat 24 |
| Asynchronous Predivider value | 127 |
| Synchronous Predivider value | 255 |

## 7.4. SYS

**Timebase Source: SysTick**

## 7.5. TIM1

**Trigger Source: ITR0**

**Clock Source : Internal Clock**

### 7.5.1. Parameter Settings:

**Counter Settings:**

| | |
|---|---|
| Prescaler (PSC - 16 bits value) | 0 |
| Counter Mode | Up |
| Counter Period (AutoReload Register - 16 bits value ) | 0 |
| 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) |

## 7.6. TIM3

**Clock Source : Internal Clock**

**Channel1: PWM Generation CH1**

### 7.6.1. Parameter Settings:

**Counter Settings:**

| | |
|---|---|
| Prescaler (PSC - 16 bits value) | 0 |
| Counter Mode | Up |
| Counter Period (AutoReload Register - 16 bits value ) | 0 |
| 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) |

**PWM Generation Channel 1:**

| | |
|---|---|
| Mode | PWM mode 1 |
| Pulse (16 bits value) | 0 |
| Output compare preload | Enable |
| Fast Mode | Disable |
| CH Polarity | High |

## 7.7. USART2

### Mode: Asynchronous

### 7.7.1. 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**

# 8. System Configuration

## 8.1. GPIO configuration

| IP | Pin | Signal | GPIO mode | GPIO pull/up pull down | Max Speed | User Label |
|---|---|---|---|---|---|---|
| RCC | PC14-OSC32_IN | RCC_OSC32_IN | n/a | n/a | n/a | |
| | PC15-OSC32_OUT | RCC_OSC32_OUT | n/a | n/a | n/a | |
| | PH0 - OSC_IN | RCC_OSC_IN | n/a | n/a | n/a | |
| | PH1 - OSC_OUT | RCC_OSC_OUT | n/a | n/a | n/a | |
| TIM3 | PC6 | TIM3_CH1 | Alternate Function Push Pull | No pull-up and no pull-down | Low | Hx711_sck |
| USART2 | PA2 | USART2_TX | Alternate Function Push Pull | **Pull-up *** | **Very High *** | |
| | PA3 | USART2_RX | Alternate Function Push Pull | **Pull-up *** | **Very High *** | |
| Single Mapped Signals | PC3 | I2S2_SD | Alternate Function Push Pull | No pull-up and no pull-down | Low | |
| | PA4 | I2S3_WS | Alternate Function Push Pull | No pull-up and no pull-down | Low | |
| | PA5 | SPI1_SCK | Alternate Function Push Pull | No pull-up and no pull-down | **Very High *** | |
| | PA6 | SPI1_MISO | Alternate Function Push Pull | No pull-up and no pull-down | **Very High *** | |
| | PA7 | SPI1_MOSI | Alternate Function Push Pull | No pull-up and no pull-down | **Very High *** | |
| | PB10 | I2S2_CK | Alternate Function Push Pull | No pull-up and no pull-down | Low | |
| | PB12 | I2S2_WS | Alternate Function Push Pull | No pull-up and no pull-down | Low | |
| | PC7 | I2S3_MCK | Alternate Function Push Pull | No pull-up and no pull-down | Low | |
| | PA9 | USART1_TX | Alternate Function Push Pull | **Pull-up *** | **Very High *** | |
| | PA10 | USART1_RX | Alternate Function Push Pull | **Pull-up *** | **Very High *** | |
| | PA13 | SYS_JTMS-SWDIO | n/a | **n/a** | **n/a** | |
| | PA14 | SYS_JTCK-SWCLK | n/a | **n/a** | **n/a** | |
| | PC10 | I2S3_CK | Alternate Function Push Pull | No pull-up and no pull-down | Low | |
| | PC12 | I2S3_SD | Alternate Function Push Pull | No pull-up and no pull-down | Low | |
| | PB3 | SYS_JTDO- | n/a | n/a | n/a | |

| IP | Pin | Signal | GPIO mode | GPIO pull/up pull down | Max Speed | User Label |
|---|---|---|---|---|---|---|
| | | SWO | | | | |
| | PB6 | I2C1_SCL | Alternate Function Open Drain | Pull-up | **Very High *** | |
| | PB9 | I2C1_SDA | Alternate Function Open Drain | Pull-up | **Very High *** | |
| GPIO | PE2 | GPIO_Input | Input mode | No pull-up and no pull-down | n/a | |
| | PE3 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | |
| | PE4 | GPIO_EXTI4 | External Interrupt Mode with Rising edge trigger detection | No pull-up and no pull-down | n/a | |
| | PE5 | GPIO_EXTI5 | External Interrupt Mode with Rising edge trigger detection | No pull-up and no pull-down | n/a | |
| | PC0 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | |
| | PA0-WKUP | GPIO_EXTI0 | External Interrupt Mode with Rising edge trigger detection | No pull-up and no pull-down | n/a | |
| | PD12 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | |
| | PD13 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | |
| | PD14 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | |
| | PD15 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | |
| | PC8 | GPIO_Input | Input mode | **Pull-up *** | n/a | hx711_dat |
| | PD4 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | |
| | PD5 | GPIO_Input | Input mode | No pull-up and no pull-down | n/a | |
| | PE1 | GPIO_EXTI1 | External Interrupt Mode with Rising edge trigger detection | No pull-up and no pull-down | n/a | |

## *8.2. DMA configuration*

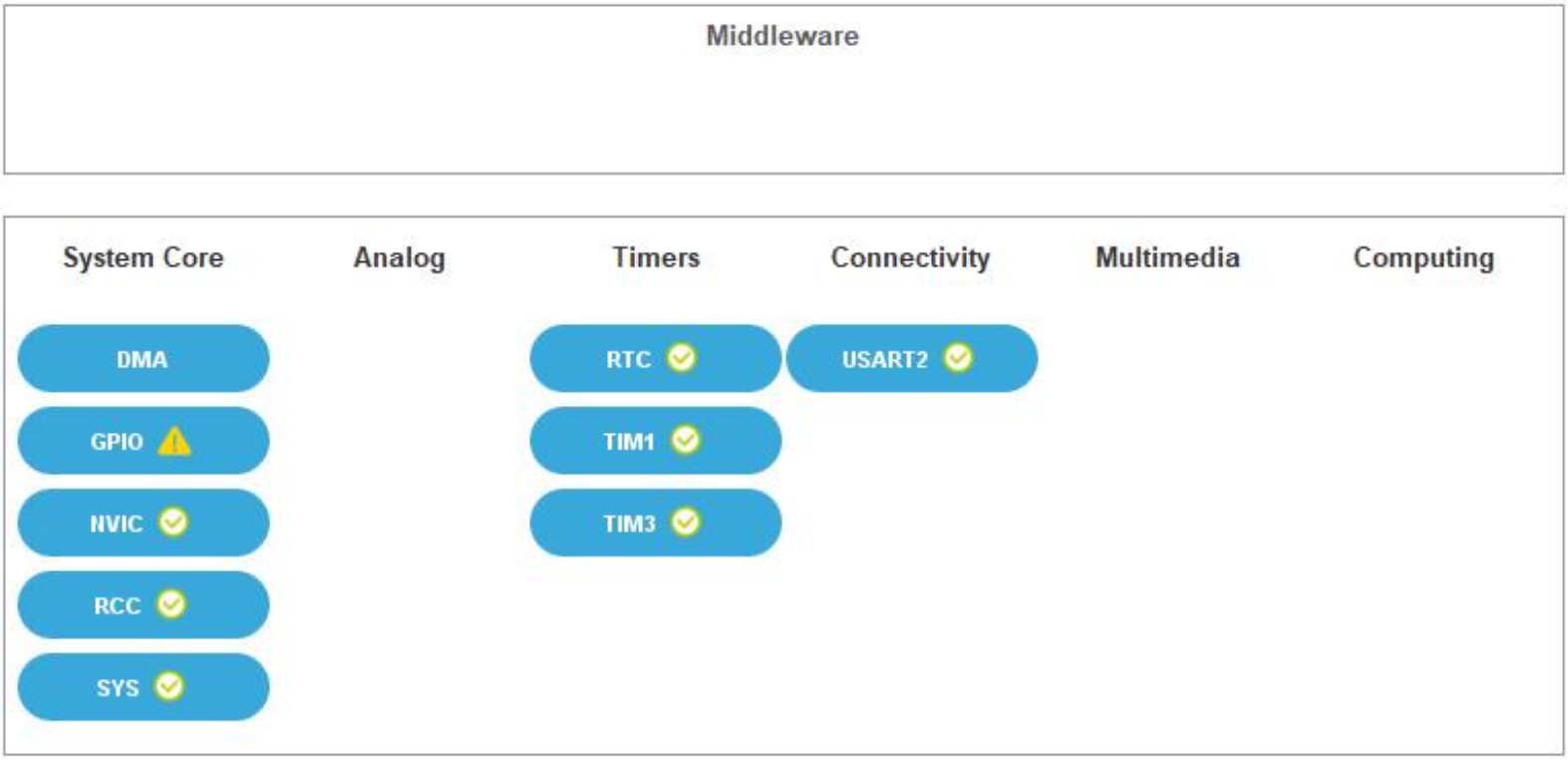
nothing configured in DMA service

## 8.3. NVIC configuration

| Interrupt Table | Enable | Preenmption Priority | SubPriority |
|---|---|---|---|
| Non maskable interrupt | true | 0 | 0 |
| Hard fault interrupt | true | 0 | 0 |
| Memory management fault | true | 0 | 0 |
| Pre-fetch 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 |
| EXTI line0 interrupt | true | 0 | 0 |
| PVD interrupt through EXTI line 16 | unused | | |
| Flash global interrupt | unused | | |
| RCC global interrupt | unused | | |
| EXTI line1 interrupt | unused | | |
| EXTI line4 interrupt | unused | | |
| EXTI line[9:5] interrupts | unused | | |
| TIM1 break interrupt and TIM9 global interrupt | unused | | |
| TIM1 update interrupt and TIM10 global interrupt | unused | | |
| TIM1 trigger and commutation interrupts and TIM11 global interrupt | unused | | |
| TIM1 capture compare interrupt | unused | | |
| TIM3 global interrupt | unused | | |
| USART2 global interrupt | unused | | |
| FPU global interrupt | unused | | |

*** User modified value**

## 9. Predefined Views - Category view : Current



# 10. Software Pack Report