



## 1. Description

### 1.1. Project

|                 |                   |
|-----------------|-------------------|
| Project Name    | stm32serial       |
| Board Name      | custom            |
| Generated with: | STM32CubeMX 6.3.0 |
| Date            | 08/31/2021        |

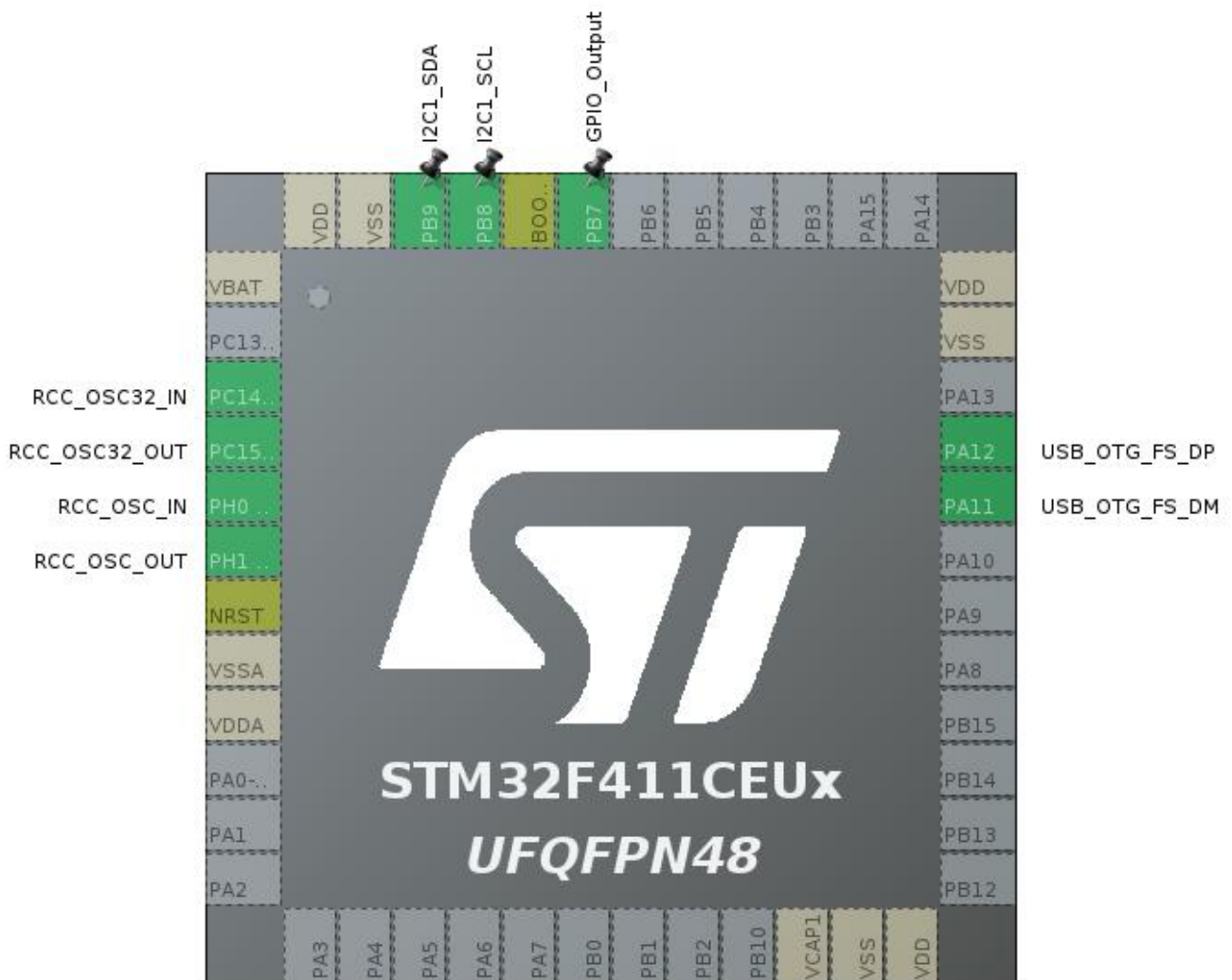
### 1.2. MCU

|                |               |
|----------------|---------------|
| MCU Series     | STM32F4       |
| MCU Line       | STM32F411     |
| MCU name       | STM32F411CEUx |
| MCU Package    | UFQFPN48      |
| MCU Pin number | 48            |

### 1.3. Core(s) information

|         |               |
|---------|---------------|
| Core(s) | Arm Cortex-M4 |
|---------|---------------|

## 2. Pinout Configuration

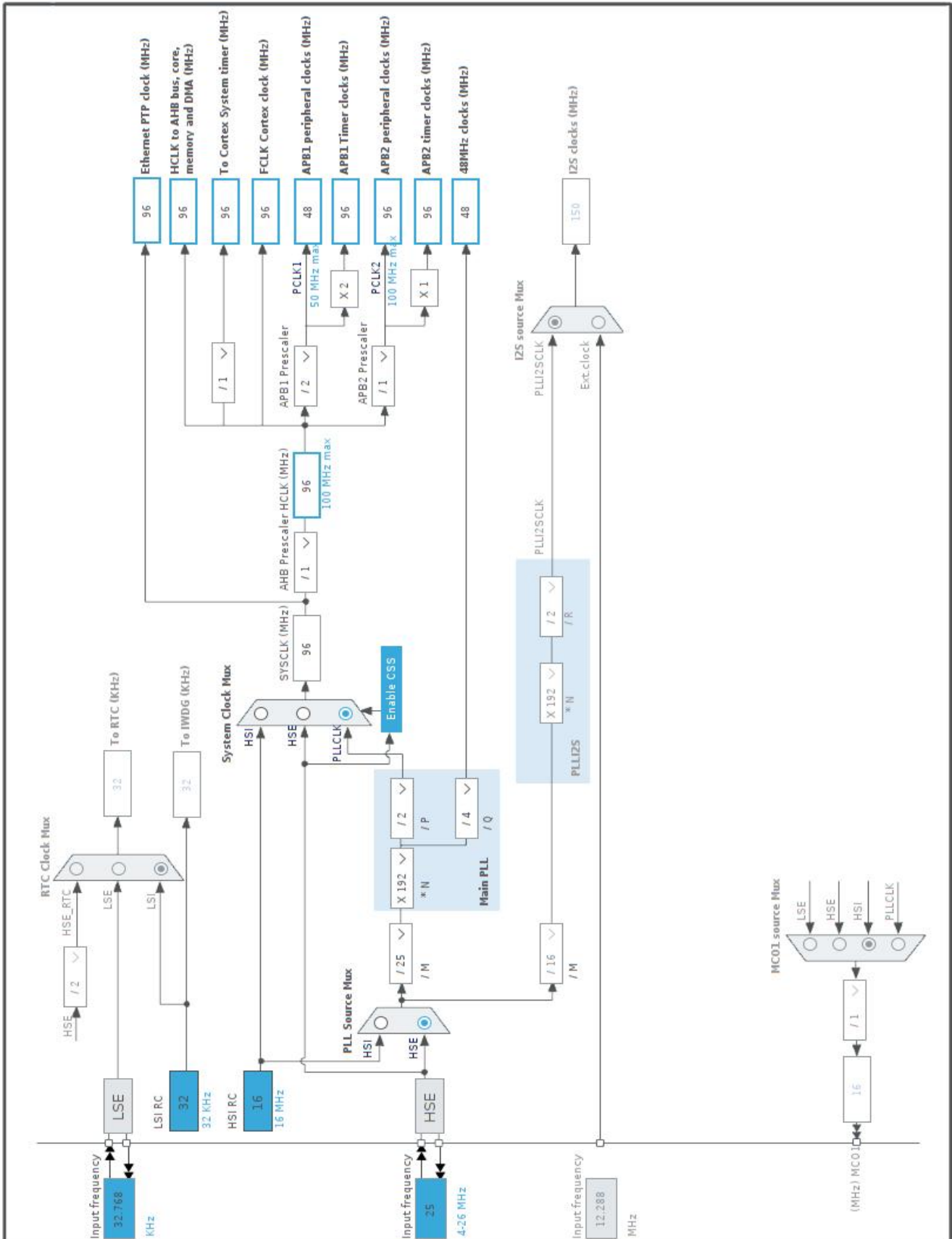


### 3. Pins Configuration

| Pin Number<br>UFQFPN48 | Pin Name<br>(function after<br>reset) | Pin Type | Alternate<br>Function(s) | Label |
|------------------------|---------------------------------------|----------|--------------------------|-------|
| 1                      | VBAT                                  | Power    |                          |       |
| 3                      | PC14-OSC32_IN                         | I/O      | RCC_OSC32_IN             |       |
| 4                      | PC15-OSC32_OUT                        | I/O      | RCC_OSC32_OUT            |       |
| 5                      | PH0 - OSC_IN                          | I/O      | RCC_OSC_IN               |       |
| 6                      | PH1 - OSC_OUT                         | I/O      | RCC_OSC_OUT              |       |
| 7                      | NRST                                  | Reset    |                          |       |
| 8                      | VSSA                                  | Power    |                          |       |
| 9                      | VDDA                                  | Power    |                          |       |
| 22                     | VCAP1                                 | Power    |                          |       |
| 23                     | VSS                                   | Power    |                          |       |
| 24                     | VDD                                   | Power    |                          |       |
| 32                     | PA11                                  | I/O      | USB_OTG_FS_DM            |       |
| 33                     | PA12                                  | I/O      | USB_OTG_FS_DP            |       |
| 35                     | VSS                                   | Power    |                          |       |
| 36                     | VDD                                   | Power    |                          |       |
| 43                     | PB7 *                                 | I/O      | GPIO_Output              |       |
| 44                     | BOOT0                                 | Boot     |                          |       |
| 45                     | PB8                                   | I/O      | I2C1_SCL                 |       |
| 46                     | PB9                                   | I/O      | I2C1_SDA                 |       |
| 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                      | stm32serial                                 |
| Project Folder                    | /home/dave/projects/stm32f11_system_monitor |
| Toolchain / IDE                   | STM32CubeIDE                                |
| Firmware Package Name and Version | STM32Cube FW_F4 V1.26.2                     |
| 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_USB_DEVICE_Init | USB_DEVICE               |
| 4    | MX_I2C1_Init       | I2C1                     |
| 5    | MX_TIM1_Init       | TIM1                     |

## 6. Power Consumption Calculator report

### 6.1. Microcontroller Selection

|           |               |
|-----------|---------------|
| Series    | STM32F4       |
| Line      | STM32F411     |
| MCU       | STM32F411CEUx |
| Datasheet | DS10314_Rev6  |

### 6.2. Parameter Selection

|             |     |
|-------------|-----|
| Temperature | 25  |
| Vdd         | 1.7 |

### 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

|                               |             |                             |
|-------------------------------|-------------|-----------------------------|
| <b>Step</b>                   | Step1       | Step2                       |
| <b>Mode</b>                   | RUN         | STOP                        |
| <b>Vdd</b>                    | 1.7         | 1.7                         |
| <b>Voltage Source</b>         | Battery     | Battery                     |
| <b>Range</b>                  | Scale1-High | No Scale                    |
| <b>Fetch Type</b>             | SRAM        | n/a                         |
| <b>CPU Frequency</b>          | 100 MHz     | 0 Hz                        |
| <b>Clock Configuration</b>    | HSE PLL     | Regulator_LPLV Flash-PwrDwn |
| <b>Clock Source Frequency</b> | 4 MHz       | 0 Hz                        |
| <b>Peripherals</b>            |             |                             |
| <b>Additional Cons.</b>       | 0 mA        | 0 mA                        |
| <b>Average Current</b>        | 12.7 mA     | 9 $\mu$ A                   |
| <b>Duration</b>               | 0.1 ms      | 0.9 ms                      |
| <b>DMIPS</b>                  | 125.0       | 0.0                         |
| <b>Ta Max</b>                 | 104.31      | 105                         |
| <b>Category</b>               | In DS Table | In DS Table                 |

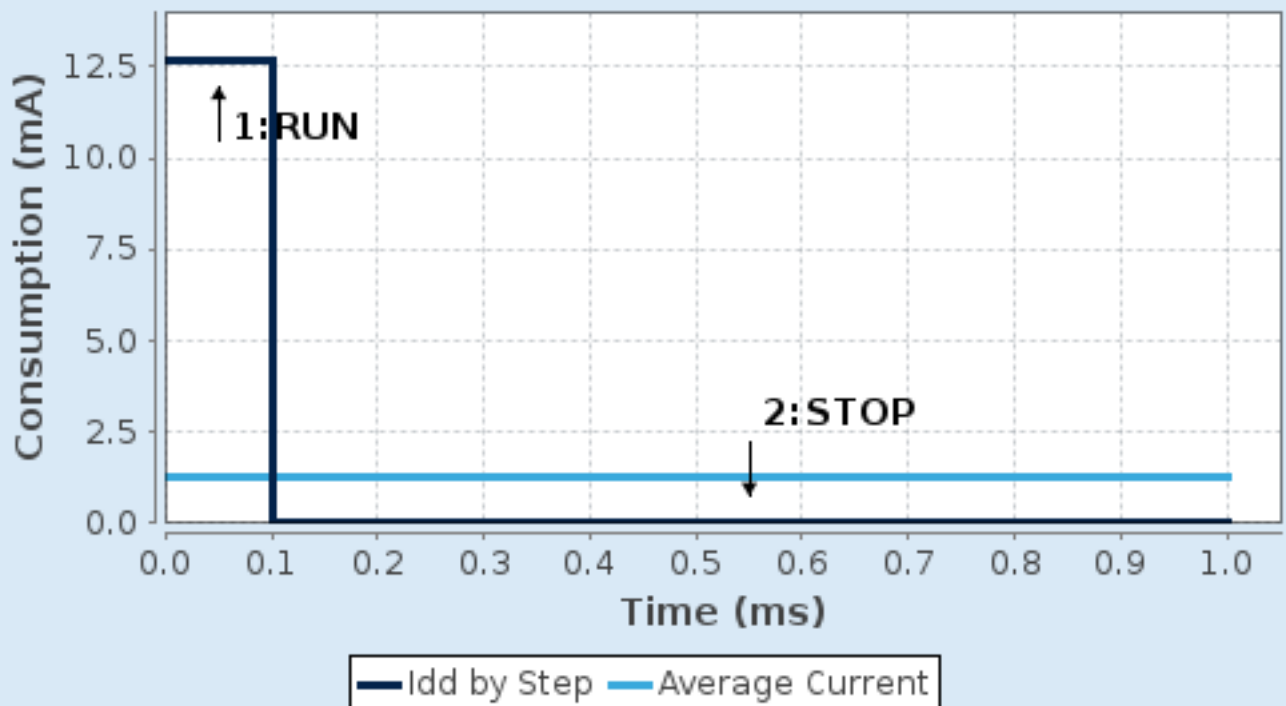
#### 6.5. Results

|               |                            |                 |             |
|---------------|----------------------------|-----------------|-------------|
| Sequence Time | 1 ms                       | Average Current | 1.28 mA     |
| Battery Life  | 3 months, 19 days, 6 hours | Average DMIPS   | 125.0 DMIPS |

#### 6.6. Chart



## Consumption Profile by Step



## 7. Peripherals and Middlewares Configuration

### 7.1. I2C1

#### I2C: I2C

##### 7.1.1. Parameter Settings:

###### Master Features:

|                      |                           |
|----------------------|---------------------------|
| I2C Speed Mode       | <b>Fast Mode *</b>        |
| 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 |

### 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 Timeout Value (ms) | 100      |
| LSE Startup Timeout Value (ms) | 5000     |

###### Power Parameters:

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

### 7.3. SYS

**Timebase Source: SysTick**

### 7.4. TIM1

**Clock Source : Internal Clock**

#### 7.4.1. 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     |

##### **Trigger Output (TRGO) Parameters:**

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

### 7.5. USB\_OTG\_FS

**Mode: Device\_Only**

#### 7.5.1. Parameter Settings:

|                       |                            |
|-----------------------|----------------------------|
| Speed                 | Device Full Speed 12MBit/s |
| Low power             | Disabled                   |
| Link Power Management | Disabled                   |
| VBUS sensing          | Disabled                   |
| Signal start of frame | Disabled                   |

### 7.6. USB\_DEVICE

**Class For FS IP: Communication Device Class (Virtual Port Com)**

#### 7.6.1. Parameter Settings:

##### **Basic Parameters:**

|  |         |
|--|---------|
| USBD_MAX_NUM_INTERFACES (Maximum number of supported interfaces)       | 1       |
| USBD_MAX_NUM_CONFIGURATION (Maximum number of supported configuration) | 1       |
| USBD_MAX_STR_DESC_SIZ (Maximum size for the string descriptors)        | 512     |
| USBD_SELF_POWERED (Enabled self power)                                 | Enabled |

USBD\_DEBUG\_LEVEL (USBD Debug Level)

0: No debug message

**Class Parameters:**

USB CDC Rx Buffer Size

2048

USB CDC Tx Buffer Size

2048

## 7.6.2. Device Descriptor:

**Device Descriptor:**

VID (Vendor Identifier)

1155

LANGID\_STRING (Language Identifier)

English(United States)

MANUFACTURER\_STRING (Manufacturer Identifier)

STMicroelectronics

**Device Descriptor FS:**

PID (Product Identifier)

22336

PRODUCT\_STRING (Product Identifier)

STM32 Virtual ComPort

CONFIGURATION\_STRING (Configuration Identifier)

CDC Config

INTERFACE\_STRING (Interface Identifier)

CDC Interface

**\* User modified value**

## 8. System Configuration

### 8.1. GPIO configuration

| IP         | Pin            | Signal        | GPIO mode                     | GPIO pull/up pull down      | Max Speed             | User Label |
|------------|----------------|---------------|-------------------------------|-----------------------------|-----------------------|------------|
| I2C1       | PB8            | I2C1_SCL      | Alternate Function Open Drain | No pull-up and no pull-down | <b>Very High</b><br>* |            |
|            | PB9            | I2C1_SDA      | Alternate Function Open Drain | No pull-up and no pull-down | <b>Very High</b><br>* |            |
| 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                   |            |
| USB_OTG_FS | PA11           | USB_OTG_FS_DM | Alternate Function Push Pull  | No pull-up and no pull-down | <b>Very High</b><br>* |            |
|            | PA12           | USB_OTG_FS_DP | Alternate Function Push Pull  | No pull-up and no pull-down | <b>Very High</b><br>* |            |
| GPIO       | PB7            | GPIO_Output   | Output Push Pull              | No pull-up and no pull-down | Low                   |            |

### 8.2. DMA configuration

nothing configured in DMA service

### 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           |
| 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   | 15                   | 0           |
| USB On The Go FS global interrupt                                  | true   | 0                    | 0           |
| PVD interrupt through EXTI line 16                                 | unused |                      |             |
| Flash global interrupt   | unused |                      |             |
| RCC global interrupt   | 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 |                      |             |
| I2C1 event interrupt   | unused |                      |             |
| I2C1 error interrupt   | unused |                      |             |
| FPU global interrupt   | 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            |
| Memory management fault                 | false                             | true                 | false            |
| Pre-fetch 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             |
| USB On The Go FS global interrupt       | false                             | true                 | true             |

**\* User modified value**

## 9. System Views

### 9.1. Category view

#### 9.1.1. Current

#### Middleware

USB\_DEVICE ✓

#### System Core

#### Analog

#### Timers

#### Connectivity

#### Multimedia

#### Computing

DMA

TIM1 ✓

I2C1 ✓

GPIO ✓

USB\_FS ✓

NVIC ✓

RCC ✓

SYS ✓



## 10. Docs & Resources

| Type               | Link  |
|--------------------|---|
| Datasheet          | <a href="http://www.st.com/resource/en/datasheet/DM00115249.pdf">http://www.st.com/resource/en/datasheet/DM00115249.pdf</a>                   |
| Reference manual   | <a href="http://www.st.com/resource/en/reference_manual/DM00119316.pdf">http://www.st.com/resource/en/reference_manual/DM00119316.pdf</a>     |
| Programming manual | <a href="http://www.st.com/resource/en/programming_manual/DM00046982.pdf">http://www.st.com/resource/en/programming_manual/DM00046982.pdf</a> |
| Errata sheet       | <a href="http://www.st.com/resource/en/errata_sheet/DM00137034.pdf">http://www.st.com/resource/en/errata_sheet/DM00137034.pdf</a>             |
| Application note   | <a href="http://www.st.com/resource/en/application_note/CD00167594.pdf">http://www.st.com/resource/en/application_note/CD00167594.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/CD00211314.pdf">http://www.st.com/resource/en/application_note/CD00211314.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/CD00249778.pdf">http://www.st.com/resource/en/application_note/CD00249778.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/CD00259245.pdf">http://www.st.com/resource/en/application_note/CD00259245.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/CD00264321.pdf">http://www.st.com/resource/en/application_note/CD00264321.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/CD00264342.pdf">http://www.st.com/resource/en/application_note/CD00264342.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/CD00264379.pdf">http://www.st.com/resource/en/application_note/CD00264379.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00024853.pdf">http://www.st.com/resource/en/application_note/DM00024853.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00040802.pdf">http://www.st.com/resource/en/application_note/DM00040802.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00040808.pdf">http://www.st.com/resource/en/application_note/DM00040808.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00042534.pdf">http://www.st.com/resource/en/application_note/DM00042534.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00046011.pdf">http://www.st.com/resource/en/application_note/DM00046011.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00072315.pdf">http://www.st.com/resource/en/application_note/DM00072315.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00073742.pdf">http://www.st.com/resource/en/application_note/DM00073742.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00073853.pdf">http://www.st.com/resource/en/application_note/DM00073853.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00080497.pdf">http://www.st.com/resource/en/application_note/DM00080497.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00081379.pdf">http://www.st.com/resource/en/application_note/DM00081379.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00115714.pdf">http://www.st.com/resource/en/application_note/DM00115714.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00129215.pdf">http://www.st.com/resource/en/application_note/DM00129215.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00144612.pdf">http://www.st.com/resource/en/application_note/DM00144612.pdf</a>     |
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Application note [http://www.st.com/resource/en/application\\_note/DM00213525.pdf](http://www.st.com/resource/en/application_note/DM00213525.pdf)  
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Application note [http://www.st.com/resource/en/application\\_note/DM00296349.pdf](http://www.st.com/resource/en/application_note/DM00296349.pdf)  
Application note [http://www.st.com/resource/en/application\\_note/DM00315319.pdf](http://www.st.com/resource/en/application_note/DM00315319.pdf)  
Application note [http://www.st.com/resource/en/application\\_note/DM00325582.pdf](http://www.st.com/resource/en/application_note/DM00325582.pdf)  
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Application note [http://www.st.com/resource/en/application\\_note/DM00354244.pdf](http://www.st.com/resource/en/application_note/DM00354244.pdf)  
Application note [http://www.st.com/resource/en/application\\_note/DM00380469.pdf](http://www.st.com/resource/en/application_note/DM00380469.pdf)  
Application note [http://www.st.com/resource/en/application\\_note/DM00395696.pdf](http://www.st.com/resource/en/application_note/DM00395696.pdf)  
Application note [http://www.st.com/resource/en/application\\_note/DM00431633.pdf](http://www.st.com/resource/en/application_note/DM00431633.pdf)  
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Application note [http://www.st.com/resource/en/application\\_note/DM00536349.pdf](http://www.st.com/resource/en/application_note/DM00536349.pdf)  
Application note [http://www.st.com/resource/en/application\\_note/DM00725181.pdf](http://www.st.com/resource/en/application_note/DM00725181.pdf)