# 1. Description

1.1. Project

| | |
|---|---|
| Project Name | rho_mod_v1 |
| Board Name | rho_mod_v1 |
| Generated with: | STM32CubeMX 4.25.0 |
| Date | 04/15/2018 |

1.2. MCU

| | |
|---|---|
| MCU Series | STM32L4 |
| MCU Line | STM32L4x2 |
| MCU name | STM32L432KBUx |
| MCU Package | UFQFPN32 |
| MCU Pin number | 32 |

## *2. Pinout Configuration*
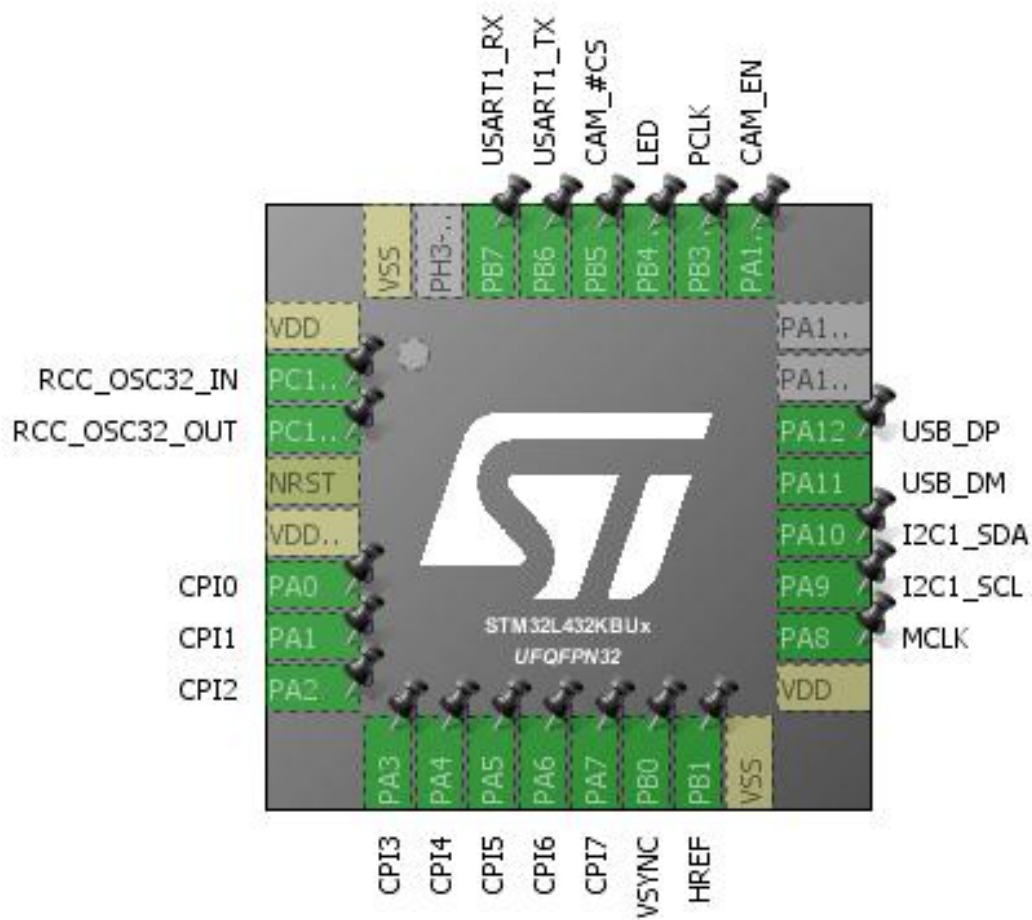
# 3. Pins Configuration

| Pin Number UFQFPN32 | Pin Name (function after reset) | Pin Type | Alternate Function(s) | Label |
|---|---|---|---|---|
| 1 | VDD | Power | | |
| 2 | PC14-OSC32_IN (PC14) | I/O | RCC_OSC32_IN | |
| 3 | PC15-OSC32_OUT (PC15) | I/O | RCC_OSC32_OUT | |
| 4 | NRST | Reset | | |
| 5 | VDDA/VREF+ | Power | | |
| 6 | PA0 * | I/O | GPIO_Input | CPI0 |
| 7 | PA1 * | I/O | GPIO_Input | CPI1 |
| 8 | PA2 * | I/O | GPIO_Input | CPI2 |
| 9 | PA3 * | I/O | GPIO_Input | CPI3 |
| 10 | PA4 * | I/O | GPIO_Input | CPI4 |
| 11 | PA5 * | I/O | GPIO_Input | CPI5 |
| 12 | PA6 * | I/O | GPIO_Input | CPI6 |
| 13 | PA7 * | I/O | GPIO_Input | CPI7 |
| 14 | PB0 | I/O | GPIO_EXTI0 | VSYNC |
| 15 | PB1 | I/O | GPIO_EXTI1 | HREF |
| 16 | VSS | Power | | |
| 17 | VDD | Power | | |
| 18 | PA8 | I/O | RCC_MCO | MCLK |
| 19 | PA9 | I/O | I2C1_SCL | |
| 20 | PA10 | I/O | I2C1_SDA | |
| 21 | PA11 | I/O | USB_DM | |
| 22 | PA12 | I/O | USB_DP | |
| 25 | PA15 (JTDI) * | I/O | GPIO_Output | CAM_EN |
| 26 | PB3 (JTDO-TRACESWO) | I/O | TIM2_CH2 | PCLK |
| 27 | PB4 (NJTRST) * | I/O | GPIO_Output | LED |
| 28 | PB5 * | I/O | GPIO_Output | CAM_#CS |
| 29 | PB6 | I/O | USART1_TX | |
| 30 | PB7 | I/O | USART1_RX | |
| 32 | VSS | Power | | |

\* The pin is affected with an I/O function

# 4. Clock Tree Configuration
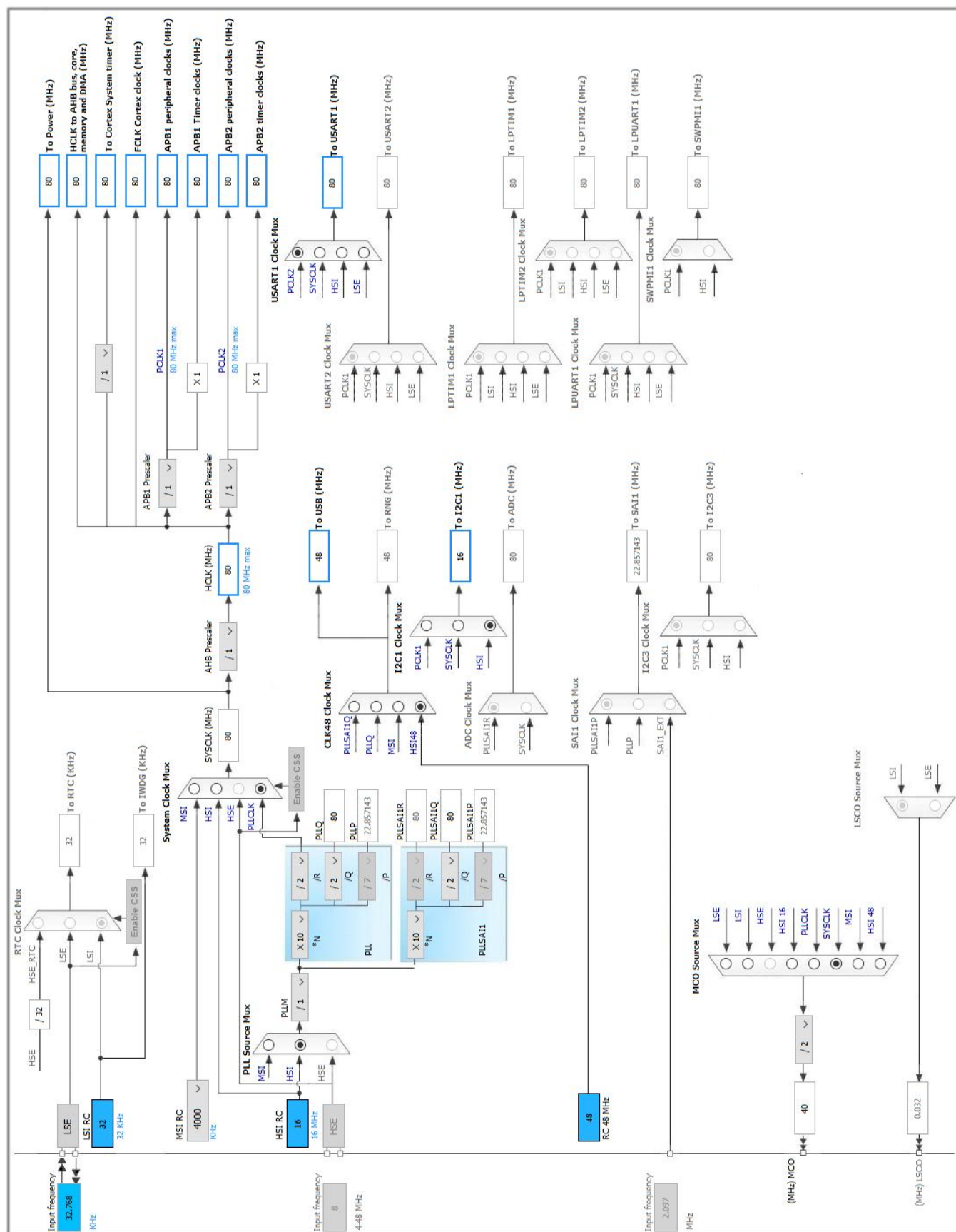
# 5. IPs and Middleware Configuration

## 5.1. I2C1
**I2C: I2C**

### 5.1.1. Parameter Settings:

**Timing configuration:**

| | |
|---|---|
| I2C Speed Mode | Standard Mode |
| I2C Speed Frequency (KHz) | 100 |
| Rise Time (ns) | 0 |
| Fall Time (ns) | 0 |
| Coefficient of Digital Filter | 0 |
| Analog Filter | Enabled |
| Timing | **0x00303D5B *** |

**Slave Features:**

| | |
|---|---|
| Clock No Stretch Mode | Disabled |
| General Call Address Detection | Disabled |
| Primary Address Length selection | 7-bit |
| Dual Address Acknowledged | Disabled |
| Primary slave address | **0x60 *** |

## 5.2. RCC
**Low Speed Clock (LSE) : Crystal/Ceramic Resonator
mode: Master Clock Output**

### 5.2.1. Parameter Settings:

**System Parameters:**

| | |
|---|---|
| VDD voltage (V) | 3.3 |
| Instruction Cache | Enabled |
| Prefetch Buffer | Disabled |
| Data Cache | Enabled |
| Flash Latency(WS) | 4 WS (5 CPU cycle) |

**RCC Parameters:**

| | |
|---|---|
| HSI Calibration Value | 16 |

| | |
|---|---|
| MSI Calibration Value | 0 |
| MSI Auto Calibration | Disabled |
| HSE Startup Timout Value (ms) | 100 |
| LSE Startup Timout Value (ms) | 5000 |

**Power Parameters:**

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

## 5.3. SYS

**Timebase Source: SysTick**

## 5.4. TIM2

**Slave Mode: External Clock Mode 1**
**Trigger Source: TI2FP2**

### 5.4.1. Parameter Settings:

**Counter Settings:**

| | |
|---|---|
| Prescaler (PSC - 16 bits value) | 0 |
| Counter Mode | **Center Aligned mode1 \*** |
| Counter Period (AutoReload Register - 32 bits value ) | **1 \*** |
| Internal Clock Division (CKD) | No Division |
| auto-reload preload | **Enable \*** |
| Slave Mode Controller | ETR mode 1 |

**Trigger Output (TRGO) Parameters:**

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

**Trigger:**

| | |
|---|---|
| Trigger Polarity | **Both Edges \*** |
| Trigger Filter (4 bits value) | **15 \*** |

## 5.5. USART1

**Mode: Asynchronous**

### 5.5.1. 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 |

**Advanced Features:**

| | |
|---|---|
| Auto Baudrate | Disable |
| 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 |

## 5.6. USB

**mode: Device (FS)**

### 5.6.1. Parameter Settings:

**Basic Parameters:**

| | |
|---|---|
| Speed | Full Speed 12MBit/s |
| Endpoint 0 Max Packet size | 64 Bytes |
| Physical interface | Internal Phy |
| Sof Enable | **Enabled *** |

**Power Parameters:**

| | |
|---|---|
| Low Power | Disabled |
| Link Power Management | Disabled |
| Battery Charging | Disabled |

## 5.7. USB_DEVICE

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

## 5.7.1. 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_SUPPORT_USER_STRING (Enable user string descriptor) | Disabled |
| USBD_SELF_POWERED (Enabled self power) | Enabled |
| USBD_DEBUG_LEVEL (USBD Debug Level) | 0: No debug message |
| USBD_LPM_ENABLED (Link Power Management) | 1: Link Power Management supported |

### Class Parameters:

| | |
|---|---|
| USB CDC Rx Buffer Size | 1000 |
| USB CDC Tx Buffer Size | 1000 |

## 5.7.2. 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 |
| SERIALNUMBER_STRING (Serial number) | 00000000001A |
| CONFIGURATION_STRING (Configuration Identifier) | CDC Config |
| INTERFACE_STRING (Interface Identifier) | CDC Interface |

**\* User modified value**

# 6. System Configuration

## 6.1. GPIO configuration

| IP | Pin | Signal | GPIO mode | GPIO pull/up pull down | Max Speed | User Label |
|---|---|---|---|---|---|---|
| I2C1 | PA9 | I2C1_SCL | Alternate Function Open Drain | Pull-up | **Very High** * | |
| | PA10 | I2C1_SDA | Alternate Function Open Drain | Pull-up | **Very High** * | |
| RCC | PC14-OSC32_IN (PC14) | RCC_OSC32_IN | n/a | n/a | n/a | |
| | PC15-OSC32_OUT (PC15) | RCC_OSC32_OUT | n/a | n/a | n/a | |
| | PA8 | RCC_MCO | Alternate Function Push Pull | No pull-up and no pull-down | Low | MCLK |
| TIM2 | PB3 (JTDO-TRACESWO) | TIM2_CH2 | Alternate Function Push Pull | No pull-up and no pull-down | **Very High** * | PCLK |
| USART1 | PB6 | USART1_TX | Alternate Function Push Pull | No pull-up and no pull-down | **Very High** * | |
| | PB7 | USART1_RX | Alternate Function Push Pull | No pull-up and no pull-down | **Very High** * | |
| USB | PA11 | USB_DM | n/a | n/a | n/a | |
| | PA12 | USB_DP | n/a | n/a | n/a | |
| GPIO | PA0 | GPIO_Input | Input mode | No pull-up and no pull-down | n/a | CPI0 |
| | PA1 | GPIO_Input | Input mode | No pull-up and no pull-down | n/a | CPI1 |
| | PA2 | GPIO_Input | Input mode | No pull-up and no pull-down | n/a | CPI2 |
| | PA3 | GPIO_Input | Input mode | No pull-up and no pull-down | n/a | CPI3 |
| | PA4 | GPIO_Input | Input mode | No pull-up and no pull-down | n/a | CPI4 |
| | PA5 | GPIO_Input | Input mode | No pull-up and no pull-down | n/a | CPI5 |
| | PA6 | GPIO_Input | Input mode | No pull-up and no pull-down | n/a | CPI6 |
| | PA7 | GPIO_Input | Input mode | No pull-up and no pull-down | n/a | CPI7 |
| | PB0 | GPIO_EXTI0 | **External Interrupt Mode with Falling edge trigger detection** | No pull-up and no pull-down | n/a | VSYNC |
| | PB1 | GPIO_EXTI1 | External Interrupt Mode with Rising edge trigger detection | No pull-up and no pull-down | n/a | HREF |
| | PA15 (JTDI) | GPIO_Output | Output Push Pull | **Pull-up *** | Low | CAM_EN |
| | | | | | | |

| IP | Pin | Signal | GPIO mode | GPIO pull/up pull down | Max Speed | User Label |
|---|---|---|---|---|---|---|
| | PB4 (NJTRST) | GPIO_Output | Output Push Pull | **Pull-up** * | Low | LED |
| | PB5 | GPIO_Output | Output Push Pull | **Pull-up** * | Low | CAM_#CS |

## 6.2. DMA configuration

| DMA request | Stream | Direction | Priority |
|---|---|---|---|
| MEMTOMEM | DMA2_Channel1 | Memory To Memory | **Very High \*** |

### MEMTOMEM: DMA2_Channel1 DMA request Settings:

| | |
|---|---|
| Mode: | Normal |
| Src Memory Increment: | Disable |
| Dst Memormy Increment: | Disable |
| Src Memory Data Width: | Byte |
| Dst Memormy Data Width: | Byte |

## *6.3. 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 |
| Prefetch fault, memory access fault | true | 0 | 0 |
| Undefined instruction or illegal state | true | 0 | 0 |
| System service call via SWI instruction | true | 0 | 1 |
| Debug monitor | true | 0 | 0 |
| Pendable request for system service | true | 0 | 0 |
| System tick timer | true | 0 | 0 |
| EXTI line0 interrupt | true | 2 | 1 |
| EXTI line1 interrupt | true | 2 | 0 |
| TIM2 global interrupt | true | 0 | 0 |
| USB event interrupt through EXTI line 17 | true | 0 | 0 |
| PVD/PVM1/PVM2/PVM3/PVM4 interrupts through EXTI lines 16/35/36/37/38 | unused | | |
| Flash global interrupt | unused | | |
| RCC global interrupt | unused | | |
| I2C1 event interrupt | unused | | |
| I2C1 error interrupt | unused | | |
| USART1 global interrupt | unused | | |
| DMA2 channel1 global interrupt | unused | | |
| FPU global interrupt | unused | | |

**\* User modified value**

# *7. Power Consumption Calculator report*

7.1. Microcontroller Selection

| | |
|---|---|
| Series | STM32L4 |
| Line | STM32L4x2 |
| MCU | STM32L432KBUx |
| Datasheet | 028798_Rev2 |

7.2. Parameter Selection

| | |
|---|---|
| Temperature | 25 |
| Vdd | null |

# 8. Software Project

## 8.1. Project Settings

| Name | Value |
|---|---|
| Project Name | rho_mod_v1 |
| Project Folder | C:\Users\Matthew |
| Toolchain / IDE | MDK-ARM V5 |
| Firmware Package Name and Version | STM32Cube FW_L4 V1.11.0 |

## 8.2. Code Generation Settings

| Name | Value |
|---|---|
| STM32Cube Firmware Library Package | 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 |

# 9. Software Pack Report