# 1. Description

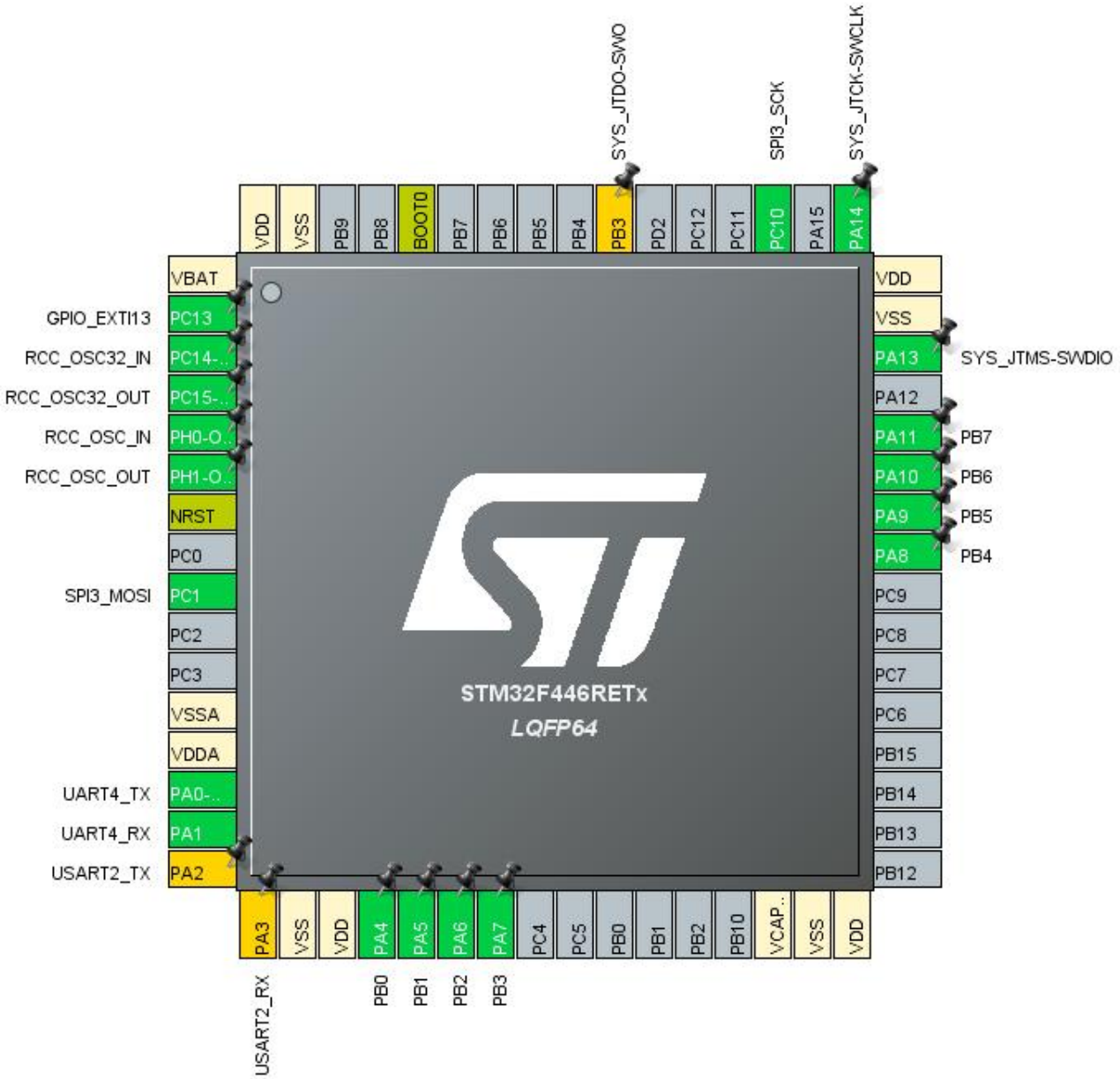
## 1.1. Project

| | |
|---|---|
| Project Name | MidiKeyboard |
| Board Name | NUCLEO-F446RE |
| Generated with: | STM32CubeMX 5.2.0 |
| Date | 05/21/2019 |

## 1.2. MCU

| | |
|---|---|
| MCU Series | STM32F4 |
| MCU Line | STM32F446 |
| MCU name | STM32F446RETx |
| MCU Package | LQFP64 |
| MCU Pin number | 64 |

## 2. Pinout Configuration

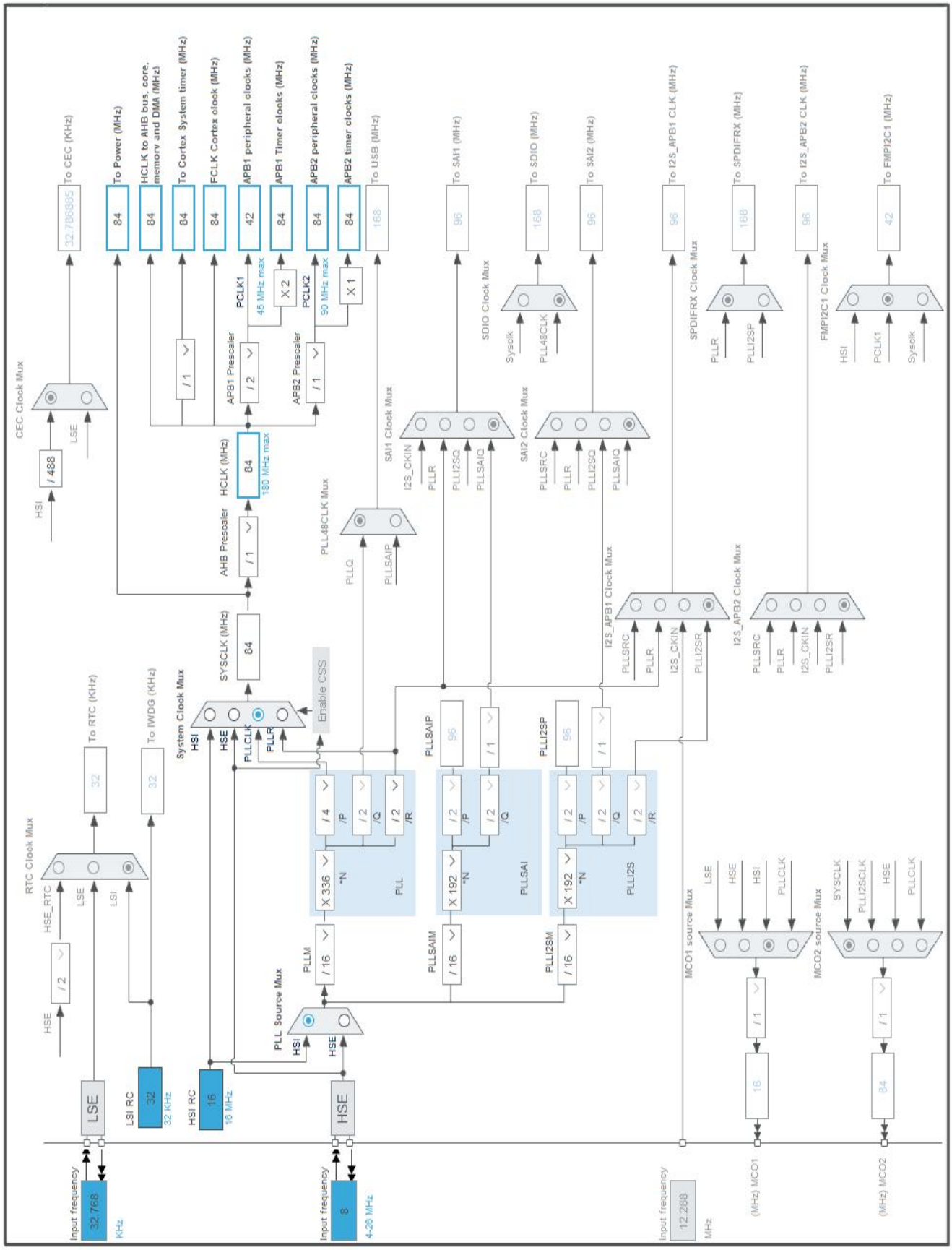


# 3. Pins Configuration

| Pin Number LQFP64 | Pin Name (function after reset) | Pin Type | Alternate Function(s) | Label |
|---|---|---|---|---|
| 1 | VBAT | Power | | |
| 2 | PC13 | I/O | GPIO_EXTI13 | |
| 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 | | |
| 9 | PC1 | I/O | SPI3_MOSI | |
| 12 | VSSA | Power | | |
| 13 | VDDA | Power | | |
| 14 | PA0-WKUP | I/O | UART4_TX | |
| 15 | PA1 | I/O | UART4_RX | |
| 16 | PA2 * | I/O | USART2_TX | |
| 17 | PA3 * | I/O | USART2_RX | |
| 18 | VSS | Power | | |
| 19 | VDD | Power | | |
| 20 | PA4 ** | I/O | GPIO_Output | PB0 |
| 21 | PA5 ** | I/O | GPIO_Output | PB1 |
| 22 | PA6 ** | I/O | GPIO_Output | PB2 |
| 23 | PA7 ** | I/O | GPIO_Output | PB3 |
| 30 | VCAP_1 | Power | | |
| 31 | VSS | Power | | |
| 32 | VDD | Power | | |
| 41 | PA8 ** | I/O | GPIO_Output | PB4 |
| 42 | PA9 ** | I/O | GPIO_Output | PB5 |
| 43 | PA10 ** | I/O | GPIO_Output | PB6 |
| 44 | PA11 ** | I/O | GPIO_Output | PB7 |
| 46 | PA13 | I/O | SYS_JTMS-SWDIO | |
| 47 | VSS | Power | | |
| 48 | VDD | Power | | |
| 49 | PA14 | I/O | SYS_JTCK-SWCLK | |
| 51 | PC10 | I/O | SPI3_SCK | |
| 55 | PB3 * | I/O | SYS_JTDO-SWO | |
| 60 | BOOT0 | Boot | | |
| 63 | VSS | Power | | |
| 64 | 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 | MidiKeyboard |
| Project Folder | C:\Users\djame\source\repos\drdpj\MidiKeyboard\MidiKeyboard |
| Toolchain / IDE | STM32CubeIDE |
| Firmware Package Name and Version | STM32Cube FW_F4 V1.24.1 |

## 5.2. Code Generation Settings

| Name | Value |
|---|---|
| STM32Cube Firmware Library Package | 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 |
| 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 | STM32F446 |
| MCU | STM32F446RETx |
| Datasheet | 027107_Rev6 |

6.2. Parameter Selection

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

# 7. IPs and Middleware Configuration

## 7.1. RCC

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

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

### 7.1.1. Parameter Settings:

**System Parameters:**

| | |
|---|---|
| VDD voltage (V) | 3.3 |
| Instruction Cache | Enabled |
| Prefetch Buffer | Enabled |
| Data Cache | Enabled |
| Flash Latency(WS) | 2 WS (3 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 Regulatror Voltage Scale | Power Regulator Voltage Scale 3 |
| Power Over Drive | Disabled |

## 7.2. SPI3

**Mode: Receive Only Slave**

### 7.2.1. Parameter Settings:

**Basic Parameters:**

| | |
|---|---|
| Frame Format | Motorola |
| Data Size | 8 Bits |
| First Bit | MSB First |

**Clock Parameters:**

| | |
|---|---|
| Clock Polarity (CPOL) | **High *** |
| Clock Phase (CPHA) | **2 Edge *** |

**Advanced Parameters:**

| | |
|---|---|
| CRC Calculation | Disabled |
| NSS Signal Type | Software |

## 7.3. SYS

**Debug: Serial Wire**

**Timebase Source: SysTick**

## 7.4. UART4

**Mode: Asynchronous**

### 7.4.1. Parameter Settings:

**Basic Parameters:**

| | |
|---|---|
| Baud Rate | **31250 *** |
| Word Length | 8 Bits (including Parity) |
| Parity | None |
| Stop Bits | 1 |

**Advanced Parameters:**

| | |
|---|---|
| Data Direction | **Receive Only *** |
| 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 | |
| SPI3 | PC1 | SPI3_MOSI | Alternate Function Push Pull | No pull-up and no pull-down | **Very High *** | |
| | PC10 | SPI3_SCK | Alternate Function Push Pull | No pull-up and no pull-down | **Very High *** | |
| SYS | PA13 | SYS_JTMS-SWDIO | n/a | n/a | n/a | |
| | PA14 | SYS_JTCK-SWCLK | n/a | n/a | n/a | |
| UART4 | PA0-WKUP | UART4_TX | Alternate Function Push Pull | Pull-up | **Very High *** | |
| | PA1 | UART4_RX | Alternate Function Push Pull | Pull-up | **Very High *** | |
| Single Mapped Signals | PA2 | USART2_TX | Alternate Function Push Pull | **Pull-up *** | **Very High *** | |
| | PA3 | USART2_RX | Alternate Function Push Pull | **Pull-up *** | **Very High *** | |
| | PB3 | SYS_JTDO-SWO | n/a | **n/a** | **n/a** | |
| GPIO | PC13 | GPIO_EXTI13 | External Interrupt Mode with Rising edge trigger detection | No pull-up and no pull-down | n/a | |
| | PA4 | GPIO_Output | **Output Open Drain *** | **Pull-up *** | **Very High *** | PB0 |
| | PA5 | GPIO_Output | **Output Open Drain *** | **Pull-up *** | **Very High *** | PB1 |
| | PA6 | GPIO_Output | **Output Open Drain *** | **Pull-up *** | **Very High *** | PB2 |
| | PA7 | GPIO_Output | **Output Open Drain *** | **Pull-up *** | **Very High** | PB3 |

| IP | Pin | Signal | GPIO mode | GPIO pull/up pull down | Max Speed | User Label |
|---|---|---|---|---|---|---|
| | | | | | * | |
| | PA8 | GPIO_Output | **Output Open Drain *** | **Pull-up *** | **Very High *** | PB4 |
| | PA9 | GPIO_Output | **Output Open Drain *** | **Pull-up *** | **Very High *** | PB5 |
| | PA10 | GPIO_Output | **Output Open Drain *** | **Pull-up *** | **Very High *** | PB6 |
| | PA11 | GPIO_Output | **Output Open Drain *** | **Pull-up *** | **Very High *** | PB7 |

## *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 |
| SPI3 global interrupt | true | 0 | 0 |
| UART4 global interrupt | true | 1 | 0 |
| PVD interrupt through EXTI line 16 | unused | | |
| Flash global interrupt | unused | | |
| RCC global interrupt | unused | | |
| EXTI line[15:10] interrupts | unused | | |
| FPU global interrupt | unused | | |

*** User modified value**

# 9. Software Pack Report