# 1. Description

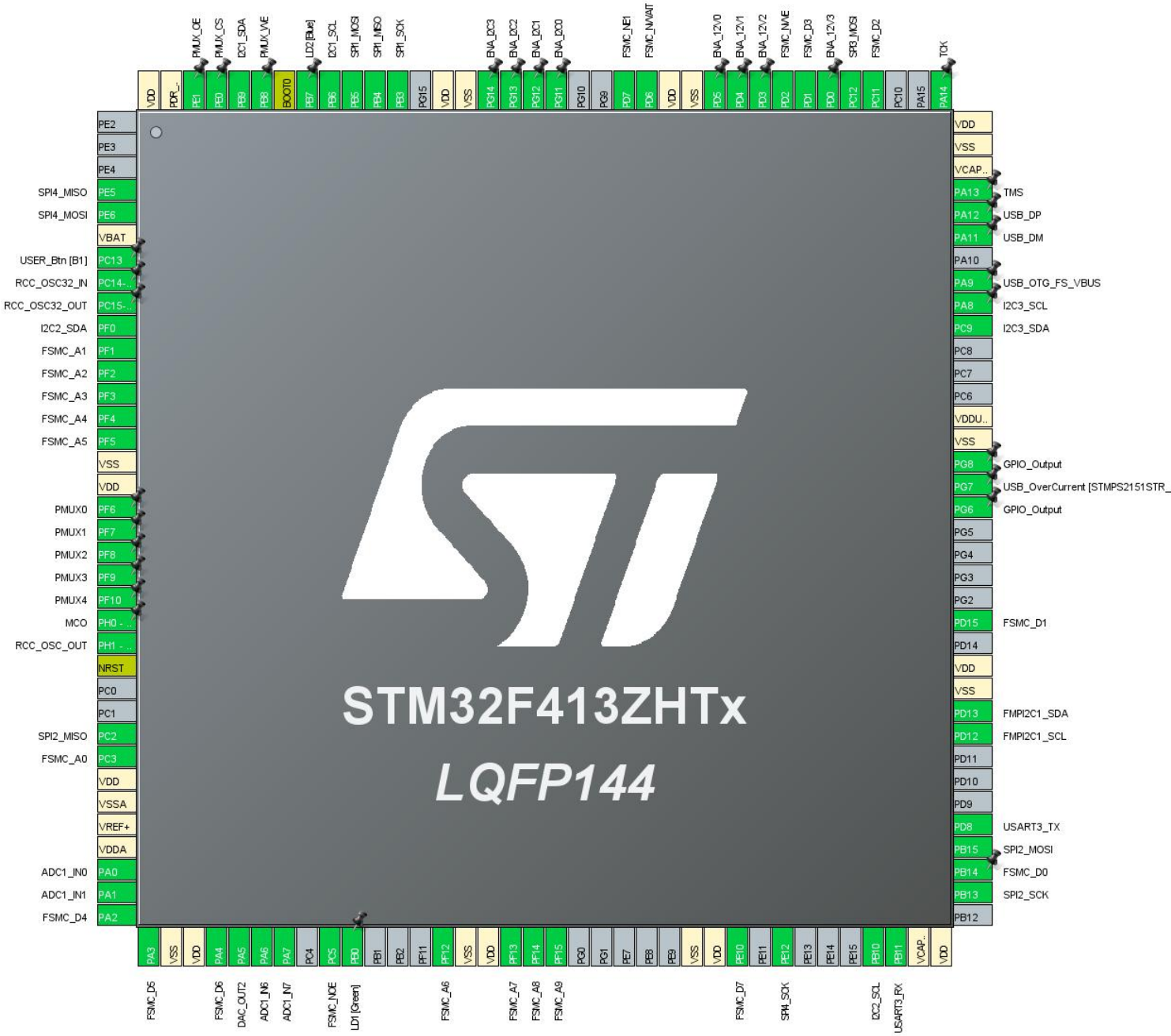
## 1.1. Project

| | |
|---|---|
| Project Name | TigerSPD_413 |
| Board Name | NUCLEO-F413ZH |
| Generated with: | STM32CubeMX 5.4.0 |
| Date | 11/27/2019 |

## 1.2. MCU

| | |
|---|---|
| MCU Series | STM32F4 |
| MCU Line | STM32F413/423 |
| MCU name | STM32F413ZHTx |
| MCU Package | LQFP144 |
| MCU Pin number | 144 |

## 2. Pinout Configuration



# 3. Pins Configuration

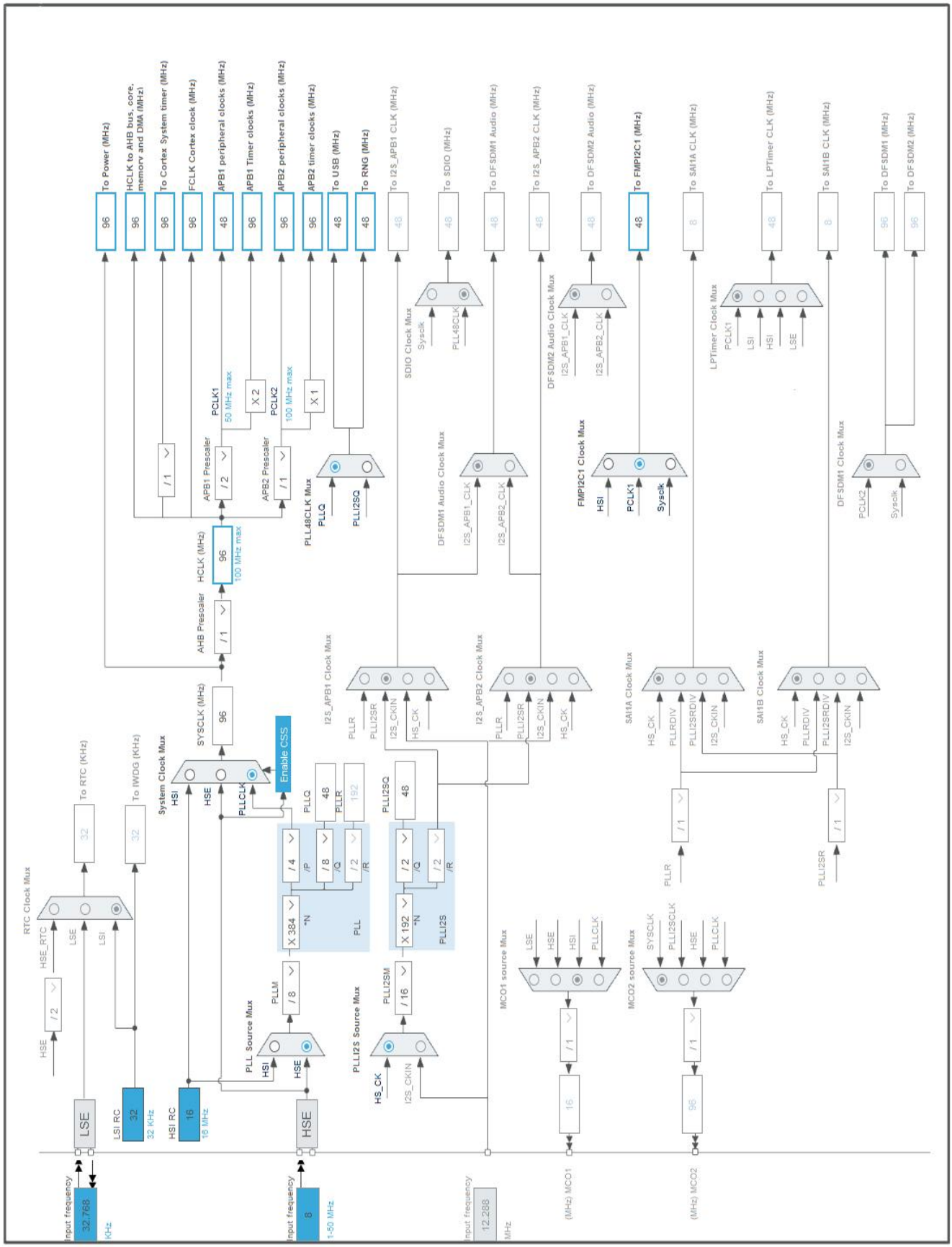
| Pin Number LQFP144 | Pin Name (function after reset) | Pin Type | Alternate Function(s) | Label |
|---|---|---|---|---|
| 4 | PE5 | I/O | SPI4_MISO | |
| 5 | PE6 | I/O | SPI4_MOSI | |
| 6 | VBAT | Power | | |
| 7 | PC13 | I/O | GPIO_EXTI13 | USER_Btn [B1] |
| 8 | PC14-OSC32_IN | I/O | RCC_OSC32_IN | |
| 9 | PC15-OSC32_OUT | I/O | RCC_OSC32_OUT | |
| 10 | PF0 | I/O | I2C2_SDA | |
| 11 | PF1 | I/O | FSMC_A1 | |
| 12 | PF2 | I/O | FSMC_A2 | |
| 13 | PF3 | I/O | FSMC_A3 | |
| 14 | PF4 | I/O | FSMC_A4 | |
| 15 | PF5 | I/O | FSMC_A5 | |
| 16 | VSS | Power | | |
| 17 | VDD | Power | | |
| 18 | PF6 * | I/O | GPIO_Output | PMUX0 |
| 19 | PF7 * | I/O | GPIO_Output | PMUX1 |
| 20 | PF8 * | I/O | GPIO_Output | PMUX2 |
| 21 | PF9 * | I/O | GPIO_Output | PMUX3 |
| 22 | PF10 * | I/O | GPIO_Output | PMUX4 |
| 23 | PH0 - OSC_IN | I/O | RCC_OSC_IN | MCO |
| 24 | PH1 - OSC_OUT | I/O | RCC_OSC_OUT | |
| 25 | NRST | Reset | | |
| 28 | PC2 | I/O | SPI2_MISO | |
| 29 | PC3 | I/O | FSMC_A0 | |
| 30 | VDD | Power | | |
| 31 | VSSA | Power | | |
| 32 | VREF+ | Power | | |
| 33 | VDDA | Power | | |
| 34 | PA0 | I/O | ADC1_IN0 | |
| 35 | PA1 | I/O | ADC1_IN1 | |
| 36 | PA2 | I/O | FSMC_D4 | |
| 37 | PA3 | I/O | FSMC_D5 | |
| 38 | VSS | Power | | |
| 39 | VDD | Power | | |
| 40 | PA4 | I/O | FSMC_D6 | |
| 41 | PA5 | I/O | DAC_OUT2 | |

| Pin Number LQFP144 | Pin Name (function after reset) | Pin Type | Alternate Function(s) | Label |
|---|---|---|---|---|
| 42 | PA6 | I/O | ADC1_IN6 | |
| 43 | PA7 | I/O | ADC1_IN7 | |
| 45 | PC5 | I/O | FSMC_NOE | |
| 46 | PB0 * | I/O | GPIO_Output | LD1 [Green] |
| 50 | PF12 | I/O | FSMC_A6 | |
| 51 | VSS | Power | | |
| 52 | VDD | Power | | |
| 53 | PF13 | I/O | FSMC_A7 | |
| 54 | PF14 | I/O | FSMC_A8 | |
| 55 | PF15 | I/O | FSMC_A9 | |
| 61 | VSS | Power | | |
| 62 | VDD | Power | | |
| 63 | PE10 | I/O | FSMC_D7 | |
| 65 | PE12 | I/O | SPI4_SCK | |
| 69 | PB10 | I/O | I2C2_SCL | |
| 70 | PB11 | I/O | USART3_RX | |
| 71 | VCAP_1 | Power | | |
| 72 | VDD | Power | | |
| 74 | PB13 | I/O | SPI2_SCK | |
| 75 | PB14 | I/O | FSMC_D0 | |
| 76 | PB15 | I/O | SPI2_MOSI | |
| 77 | PD8 | I/O | USART3_TX | |
| 81 | PD12 | I/O | FMPI2C1_SCL | |
| 82 | PD13 | I/O | FMPI2C1_SDA | |
| 83 | VSS | Power | | |
| 84 | VDD | Power | | |
| 86 | PD15 | I/O | FSMC_D1 | |
| 91 | PG6 * | I/O | GPIO_Output | |
| 92 | PG7 * | I/O | GPIO_Input | USB_OverCurrent [STMPS2151STR_FAULT] |
| 93 | PG8 * | I/O | GPIO_Output | |
| 94 | VSS | Power | | |
| 95 | VDDUSB | Power | | |
| 99 | PC9 | I/O | I2C3_SDA | |
| 100 | PA8 | I/O | I2C3_SCL | |
| 101 | PA9 | I/O | USB_OTG_FS_VBUS | |
| 103 | PA11 | I/O | USB_OTG_FS_DM | USB_DM |
| 104 | PA12 | I/O | USB_OTG_FS_DP | USB_DP |
| 105 | PA13 | I/O | SYS_JTMS-SWDIO | TMS |

| Pin Number LQFP144 | Pin Name (function after reset) | Pin Type | Alternate Function(s) | Label |
|---|---|---|---|---|
| 106 | VCAP_2 | Power | | |
| 107 | VSS | Power | | |
| 108 | VDD | Power | | |
| 109 | PA14 | I/O | SYS_JTCK-SWCLK | TCK |
| 112 | PC11 | I/O | FSMC_D2 | |
| 113 | PC12 | I/O | SPI3_MOSI | |
| 114 | PD0 * | I/O | GPIO_Output | ENA_12V3 |
| 115 | PD1 | I/O | FSMC_D3 | |
| 116 | PD2 | I/O | FSMC_NWE | |
| 117 | PD3 * | I/O | GPIO_Output | ENA_12V2 |
| 118 | PD4 * | I/O | GPIO_Output | ENA_12V1 |
| 119 | PD5 * | I/O | GPIO_Output | ENA_12V0 |
| 120 | VSS | Power | | |
| 121 | VDD | Power | | |
| 122 | PD6 | I/O | FSMC_NWAIT | |
| 123 | PD7 | I/O | FSMC_NE1 | |
| 126 | PG11 * | I/O | GPIO_Output | ENA_I2C0 |
| 127 | PG12 * | I/O | GPIO_Output | ENA_I2C1 |
| 128 | PG13 * | I/O | GPIO_Output | ENA_I2C2 |
| 129 | PG14 * | I/O | GPIO_Output | ENA_I2C3 |
| 130 | VSS | Power | | |
| 131 | VDD | Power | | |
| 133 | PB3 | I/O | SPI1_SCK | |
| 134 | PB4 | I/O | SPI1_MISO | |
| 135 | PB5 | I/O | SPI1_MOSI | |
| 136 | PB6 | I/O | I2C1_SCL | |
| 137 | PB7 * | I/O | GPIO_Output | LD2 [Blue] |
| 138 | BOOT0 | Boot | | |
| 139 | PB8 * | I/O | GPIO_Output | PMUX_WE |
| 140 | PB9 | I/O | I2C1_SDA | |
| 141 | PE0 * | I/O | GPIO_Output | PMUX_CS |
| 142 | PE1 * | I/O | GPIO_Output | PMUX_OE |
| 143 | PDR_ON | Power | | |
| 144 | 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 | TigerSPD_413 |
| Project Folder | C:\tigerspd-413 |
| Toolchain / IDE | STM32CubeIDE |
| Firmware Package Name and Version | STM32Cube FW_F4 V1.24.1 |

## 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 | Yes |
| Backup previously generated files 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 |

# 6. Power Consumption Calculator report

6.1. Microcontroller Selection

| | |
|---|---|
| Series | STM32F4 |
| Line | STM32F413/423 |
| MCU | STM32F413ZHTx |
| Datasheet | 029162_Rev5 |

6.2. Parameter Selection

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

# 7. IPs and Middleware Configuration

## 7.1. ADC1

**mode: IN0**

**mode: IN1**

**mode: IN6**

**mode: IN7**

### 7.1.1. Parameter Settings:

**ADC_Settings:**

| | |
|---|---|
| Clock Prescaler | PCLK2 divided by 4 |
| Resolution | 12 bits (15 ADC Clock cycles) |
| Data Alignment | Right alignment |
| Scan Conversion Mode | Disabled |
| Continuous Conversion Mode | Disabled |
| Discontinuous Conversion Mode | Disabled |
| DMA Continuous Requests | Disabled |
| End Of Conversion Selection | EOC flag at the end of single channel conversion |

**ADC_Regular_ConversionMode:**

| | |
|---|---|
| Number Of Conversion | 1 |
| External Trigger Conversion Source | Regular Conversion launched by software |
| External Trigger Conversion Edge | None |
| Rank | 1 |
| Channel | Channel 0 |
| Sampling Time | 3 Cycles |

**ADC_Injected_ConversionMode:**

| | |
|---|---|
| Number Of Conversions | 0 |

**WatchDog:**

| | |
|---|---|
| Enable Analog WatchDog Mode | false |

## 7.2. DAC

**mode: OUT2 Configuration**

### 7.2.1. Parameter Settings:

**DAC Out2 Settings:**

| | |
|---|---|
| Output Buffer | Enable |
| Trigger | None |

## 7.3. FMPI2C1

### I2C: I2C

### 7.3.1. 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 | **0x20303E5D *** |

**Slave Features:**

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

## 7.4. FSMC

*NOR Flash/PSRAM/SRAM/ROM/LCD 1*

### Chip Select: NE1

### Memory type: SRAM

### Address: 10 bits

### Data: 8 bits

### Wait: Asynchronous

### 7.4.1. NOR/PSRAM 1:

**NOR/PSRAM control:**

| | |
|---|---|
| Memory type | SRAM |
| Bank | Bank 1 NOR/PSRAM 1 |
| Write operation | **Enabled *** |
| Write FIFO | **Disabled *** |
| Extended mode | Disabled |
| Wait signal polarity | Low polarity |

**NOR/PSRAM timing:**

| | |
|---|---|
| Address setup time in HCLK clock cycles | 15 |
| Data setup time in HCLK clock cycles | **25 *** |
| Bus turn around time in HCLK clock cycles | 15 |

## 7.5. GPIO

## 7.6. I2C1

### I2C: I2C

### 7.6.1. Parameter Settings:

**Master Features:**

| | |
|---|---|
| I2C Speed Mode | **Fast Mode *** |
| 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 |

## 7.7. I2C2

### I2C: I2C

### 7.7.1. Parameter Settings:

**Master Features:**

| | |
|---|---|
| I2C Speed Mode | Standard Mode |
| I2C Clock Speed (Hz) | 100000 |

**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 |

## 7.8. I2C3

### I2C: I2C

### 7.8.1. Parameter Settings:

**Master Features:**

| | |
|---|---|
| I2C Speed Mode | Standard Mode |
| I2C Clock Speed (Hz) | 100000 |

**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 |

## 7.9. RCC

### High Speed Clock (HSE): BYPASS Clock Source

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

### 7.9.1. 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 |

## 7.10. RNG

**mode: Activated**

## 7.11. SPI1

**Mode: Full-Duplex Master**

### 7.11.1. Parameter Settings:

**Basic Parameters:**

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

**Clock Parameters:**

| | |
|---|---|
| Prescaler (for Baud Rate) | 2 |
| Baud Rate | **48.0 MBits/s *** |
| Clock Polarity (CPOL) | Low |
| Clock Phase (CPHA) | 1 Edge |

**Advanced Parameters:**

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

## 7.12. SPI2

**Mode: Full-Duplex Master**

### 7.12.1. Parameter Settings:

**Basic Parameters:**

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

**Clock Parameters:**

| | |
|---|---|
| Prescaler (for Baud Rate) | 2 |
| Baud Rate | **24.0 MBits/s *** |
| Clock Polarity (CPOL) | Low |
| Clock Phase (CPHA) | 1 Edge |

**Advanced Parameters:**

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

## 7.13. SPI4

### Mode: Full-Duplex Master

### 7.13.1. Parameter Settings:

**Basic Parameters:**

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

**Clock Parameters:**

| | |
|---|---|
| Prescaler (for Baud Rate) | 2 |
| Baud Rate | **48.0 MBits/s *** |
| Clock Polarity (CPOL) | Low |
| Clock Phase (CPHA) | 1 Edge |

**Advanced Parameters:**

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

## 7.14. SYS

### Debug: Serial Wire

### Timebase Source: TIM1

## 7.15. USART3

### Mode: Asynchronous

### 7.15.1. 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 |

## 7.16. USB_OTG_FS

**Mode: Device_Only**

**Activate_VBUS: VBUS sensing**

### 7.16.1. Parameter Settings:

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

## 7.17. FREERTOS

**Interface: CMSIS_V1**

### 7.17.1. Config parameters:

**API:**

| | |
|---|---|
| FreeRTOS API | CMSIS v1 |

**Versions:**

| | |
|---|---|
| FreeRTOS version | 10.0.1 |
| CMSIS-RTOS version | 1.02 |

**Kernel settings:**

| | |
|---|---|
| USE_PREEMPTION | Enabled |
| CPU_CLOCK_HZ | SystemCoreClock |
| TICK_RATE_HZ | 1000 |
| MAX_PRIORITIES | 7 |
| MINIMAL_STACK_SIZE | **1024 *** |
| MAX_TASK_NAME_LEN | 16 |
| USE_16_BIT_TICKS | Disabled |
| IDLE_SHOULD_YIELD | Enabled |
| USE_MUTEXES | Enabled |
| USE_RECURSIVE_MUTEXES | Disabled |
| USE_COUNTING_SEMAPHORES | Disabled |
| QUEUE_REGISTRY_SIZE | 8 |
| USE_APPLICATION_TASK_TAG | Disabled |
| ENABLE_BACKWARD_COMPATIBILITY | Enabled |
| USE_PORT_OPTIMISED_TASK_SELECTION | Enabled |

| | |
|---|---|
| USE_TICKLESS_IDLE | Disabled |
| USE_TASK_NOTIFICATIONS | Enabled |
| RECORD_STACK_HIGH_ADDRESS | **Enabled *** |

**Memory management settings:**

| | |
|---|---|
| Memory Allocation | Dynamic / Static |
| TOTAL_HEAP_SIZE | **131072 *** |
| Memory Management scheme | heap_4 |

**Hook function related definitions:**

| | |
|---|---|
| USE_IDLE_HOOK | Disabled |
| USE_TICK_HOOK | Disabled |
| USE_MALLOC_FAILED_HOOK | **Enabled *** |
| USE_DAEMON_TASK_STARTUP_HOOK | Disabled |
| CHECK_FOR_STACK_OVERFLOW | **Option2 *** |

**Run time and task stats gathering related definitions:**

| | |
|---|---|
| GENERATE_RUN_TIME_STATS | Disabled |
| USE_TRACE_FACILITY | Disabled |
| USE_STATS_FORMATTING_FUNCTIONS | Disabled |

**Co-routine related definitions:**

| | |
|---|---|
| USE_CO_ROUTINES | Disabled |
| MAX_CO_ROUTINE_PRIORITIES | 2 |

**Software timer definitions:**

| | |
|---|---|
| USE_TIMERS | Disabled |

**Interrupt nesting behaviour configuration:**

| | |
|---|---|
| LIBRARY_LOWEST_INTERRUPT_PRIORITY | 15 |
| LIBRARY_MAX_SYSCALL_INTERRUPT_PRIORITY | 5 |

## 7.17.2. Include parameters:

**Include definitions:**

| | |
|---|---|
| vTaskPrioritySet | Enabled |
| uxTaskPriorityGet | Enabled |
| vTaskDelete | Enabled |
| vTaskCleanUpResources | Disabled |
| vTaskSuspend | Enabled |
| vTaskDelayUntil | Disabled |
| vTaskDelay | Enabled |
| xTaskGetSchedulerState | Enabled |
| xTaskResumeFromISR | Enabled |
| xQueueGetMutexHolder | Disabled |
| xSemaphoreGetMutexHolder | Disabled |

| | |
|---|---|
| pcTaskGetTaskName | Disabled |
| uxTaskGetStackHighWaterMark | **Enabled *** |
| xTaskGetCurrentTaskHandle | Disabled |
| eTaskGetState | Disabled |
| xEventGroupSetBitFromISR | Disabled |
| xTimerPendFunctionCall | Disabled |
| xTaskAbortDelay | Disabled |
| xTaskGetHandle | Disabled |

## *7.18. USB_DEVICE*

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

### 7.18.1. 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 |

### 7.18.2. 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 / KTI 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 |
|---|---|---|---|---|---|---|
| ADC1 | PA0 | ADC1_IN0 | Analog mode | No pull-up and no pull-down | n/a | |
| | PA1 | ADC1_IN1 | Analog mode | No pull-up and no pull-down | n/a | |
| | PA6 | ADC1_IN6 | Analog mode | No pull-up and no pull-down | n/a | |
| | PA7 | ADC1_IN7 | Analog mode | No pull-up and no pull-down | n/a | |
| DAC | PA5 | DAC_OUT2 | Analog mode | No pull-up and no pull-down | n/a | |
| FMPI2C1 | PD12 | FMPI2C1_SCL | Alternate Function Open Drain | Pull-up | **High *** | |
| | PD13 | FMPI2C1_SDA | Alternate Function Open Drain | Pull-up | **High *** | |
| FSMC | PF1 | FSMC_A1 | Alternate Function Push Pull | No pull-up and no pull-down | High | |
| | PF2 | FSMC_A2 | Alternate Function Push Pull | No pull-up and no pull-down | High | |
| | PF3 | FSMC_A3 | Alternate Function Push Pull | No pull-up and no pull-down | High | |
| | PF4 | FSMC_A4 | Alternate Function Push Pull | No pull-up and no pull-down | High | |
| | PF5 | FSMC_A5 | Alternate Function Push Pull | No pull-up and no pull-down | High | |
| | PC3 | FSMC_A0 | Alternate Function Push Pull | No pull-up and no pull-down | High | |
| | PA2 | FSMC_D4 | Alternate Function Push Pull | No pull-up and no pull-down | High | |
| | PA3 | FSMC_D5 | Alternate Function Push Pull | No pull-up and no pull-down | High | |
| | PA4 | FSMC_D6 | Alternate Function Push Pull | No pull-up and no pull-down | High | |
| | PC5 | FSMC_NOE | Alternate Function Push Pull | No pull-up and no pull-down | High | |
| | PF12 | FSMC_A6 | Alternate Function Push Pull | No pull-up and no pull-down | High | |
| | PF13 | FSMC_A7 | Alternate Function Push Pull | No pull-up and no pull-down | High | |
| | PF14 | FSMC_A8 | Alternate Function Push Pull | No pull-up and no pull-down | High | |
| | PF15 | FSMC_A9 | Alternate Function Push Pull | No pull-up and no pull-down | High | |
| | PE10 | FSMC_D7 | Alternate Function Push Pull | No pull-up and no pull-down | High | |
| | PB14 | FSMC_D0 | Alternate Function Push Pull | No pull-up and no pull-down | High | |
| | PD15 | FSMC_D1 | Alternate Function Push Pull | No pull-up and no pull-down | High | |
| | PC11 | FSMC_D2 | Alternate Function Push Pull | No pull-up and no pull-down | High | |
| | PD1 | FSMC_D3 | Alternate Function Push Pull | No pull-up and no pull-down | High | |
| | PD2 | FSMC_NWE | Alternate Function Push Pull | No pull-up and no pull-down | High | |
| | PD6 | FSMC_NWAIT | Alternate Function Push Pull | No pull-up and no pull-down | High | |
| | PD7 | FSMC_NE1 | Alternate Function Push Pull | No pull-up and no pull-down | High | |
| I2C1 | PB6 | I2C1_SCL | Alternate Function Open Drain | Pull-up | **High *** | |
| | PB9 | I2C1_SDA | Alternate Function Open Drain | Pull-up | **High *** | |
| I2C2 | PF0 | I2C2_SDA | Alternate Function Open Drain | Pull-up | **High *** | |

| IP | Pin | Signal | GPIO mode | GPIO pull/up pull down | Max Speed | User Label |
|---|---|---|---|---|---|---|
| | PB10 | I2C2_SCL | Alternate Function Open Drain | Pull-up | **High *** | |
| I2C3 | PC9 | I2C3_SDA | Alternate Function Open Drain | Pull-up | **High *** | |
| | PA8 | I2C3_SCL | Alternate Function Open Drain | Pull-up | **High *** | |
| 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 | MCO |
| | PH1 - OSC_OUT | RCC_OSC_OUT | n/a | n/a | n/a | |
| SPI1 | PB3 | SPI1_SCK | Alternate Function Push Pull | No pull-up and no pull-down | **High *** | |
| | PB4 | SPI1_MISO | Alternate Function Push Pull | No pull-up and no pull-down | **High *** | |
| | PB5 | SPI1_MOSI | Alternate Function Push Pull | No pull-up and no pull-down | **High *** | |
| SPI2 | PC2 | SPI2_MISO | Alternate Function Push Pull | No pull-up and no pull-down | **High *** | |
| | PB13 | SPI2_SCK | Alternate Function Push Pull | No pull-up and no pull-down | **High *** | |
| | PB15 | SPI2_MOSI | Alternate Function Push Pull | No pull-up and no pull-down | **High *** | |
| SPI4 | PE5 | SPI4_MISO | Alternate Function Push Pull | No pull-up and no pull-down | **High *** | |
| | PE6 | SPI4_MOSI | Alternate Function Push Pull | No pull-up and no pull-down | **High *** | |
| | PE12 | SPI4_SCK | Alternate Function Push Pull | No pull-up and no pull-down | **High *** | |
| SYS | PA13 | SYS_JTMS-SWDIO | n/a | n/a | n/a | TMS |
| | PA14 | SYS_JTCK-SWCLK | n/a | n/a | n/a | TCK |
| USART3 | PB11 | USART3_RX | Alternate Function Push Pull | Pull-up | **High *** | |
| | PD8 | USART3_TX | Alternate Function Push Pull | Pull-up | **High *** | |
| USB_OTG_FS | PA9 | USB_OTG_FS_VBUS | Input mode | No pull-up and no pull-down | n/a | |
| | PA11 | USB_OTG_FS_DM | Alternate Function Push Pull | No pull-up and no pull-down | **High *** | USB_DM |
| | PA12 | USB_OTG_FS_DP | Alternate Function Push Pull | No pull-up and no pull-down | **High *** | USB_DP |
| GPIO | PC13 | GPIO_EXTI13 | External Interrupt Mode with Rising edge trigger detection | No pull-up and no pull-down | n/a | USER_Btn [B1] |
| | PF6 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | PMUX0 |
| | PF7 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | PMUX1 |
| | PF8 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | PMUX2 |

| IP | Pin | Signal | GPIO mode | GPIO pull/up pull down | Max Speed | User Label |
|---|---|---|---|---|---|---|
| | PF9 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | PMUX3 |
| | PF10 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | PMUX4 |
| | PB0 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | LD1 [Green] |
| | PG6 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | |
| | PG7 | GPIO_Input | Input mode | No pull-up and no pull-down | n/a | USB_OverCurrent [STMPS2151STR_FAULT] |
| | PG8 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | |
| | PD0 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | ENA_12V3 |
| | PD3 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | ENA_12V2 |
| | PD4 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | ENA_12V1 |
| | PD5 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | ENA_12V0 |
| | PG11 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | ENA_I2C0 |
| | PG12 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | ENA_I2C1 |
| | PG13 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | ENA_I2C2 |
| | PG14 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | ENA_I2C3 |
| | PB7 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | LD2 [Blue] |
| | PB8 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | PMUX_WE |
| | PE0 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | PMUX_CS |
| | PE1 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | PMUX_OE |

## *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 | 15 | 0 |
| System tick timer | true | 15 | 0 |
| TIM1 update interrupt and TIM10 global interrupt | true | 0 | 0 |
| USB On The Go FS global interrupt | true | 5 | 0 |
| PVD interrupt through EXTI line 16 | unused | | |
| Flash global interrupt | unused | | |
| RCC global interrupt | unused | | |
| ADC1 global interrupt | unused | | |
| I2C1 event interrupt | unused | | |
| I2C1 error interrupt | unused | | |
| I2C2 event interrupt | unused | | |
| I2C2 error interrupt | unused | | |
| SPI1 global interrupt | unused | | |
| SPI2 global interrupt | unused | | |
| USART3 global interrupt | unused | | |
| EXTI line[15:10] interrupts | unused | | |
| TIM6 global interrupt, DAC1 and DAC2 underrun error interrupts | unused | | |
| I2C3 event interrupt | unused | | |
| I2C3 error interrupt | unused | | |
| RNG global interrupt | unused | | |
| FPU global interrupt | unused | | |
| SPI4 global interrupt | unused | | |
| FMPI2C1 event interrupt | unused | | |
| FMPI2C1 error interrupt | unused | | |

*** User modified value**

# 9. Software Pack Report