

1. Description

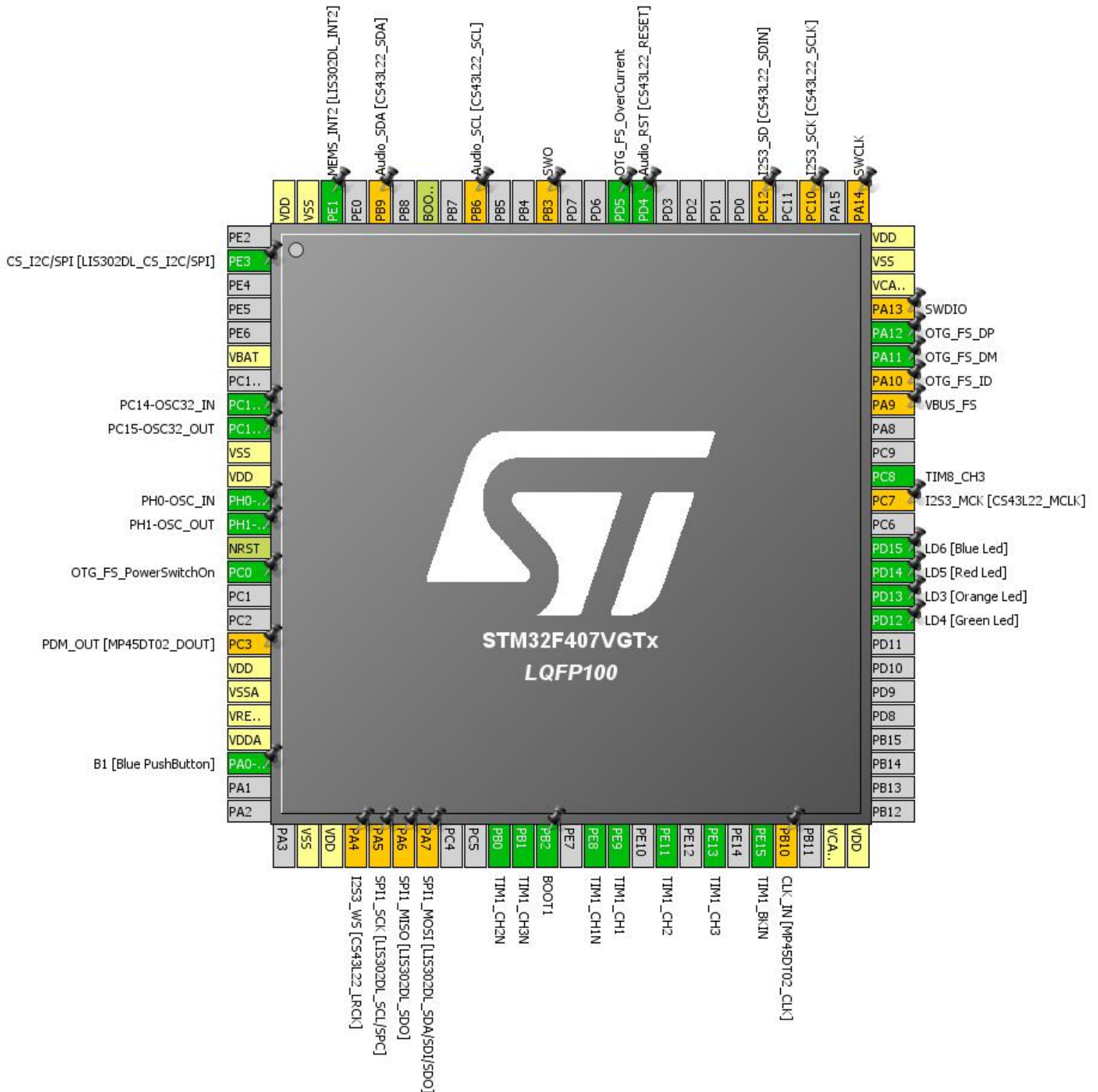
1.1. Project

| | |
|-----------------|--------------------|
| Project Name | STM32F4T1 |
| Board Name | STM32F4DISCOVERY |
| Generated with: | STM32CubeMX 4.20.1 |
| Date | 05/06/2017 |

1.2. MCU

| | |
|----------------|---------------|
| MCU Series | STM32F4 |
| MCU Line | STM32F407/417 |
| MCU name | STM32F407VGTx |
| MCU Package | LQFP100 |
| MCU Pin number | 100 |

2. Pinout Configuration



3. Pins Configuration

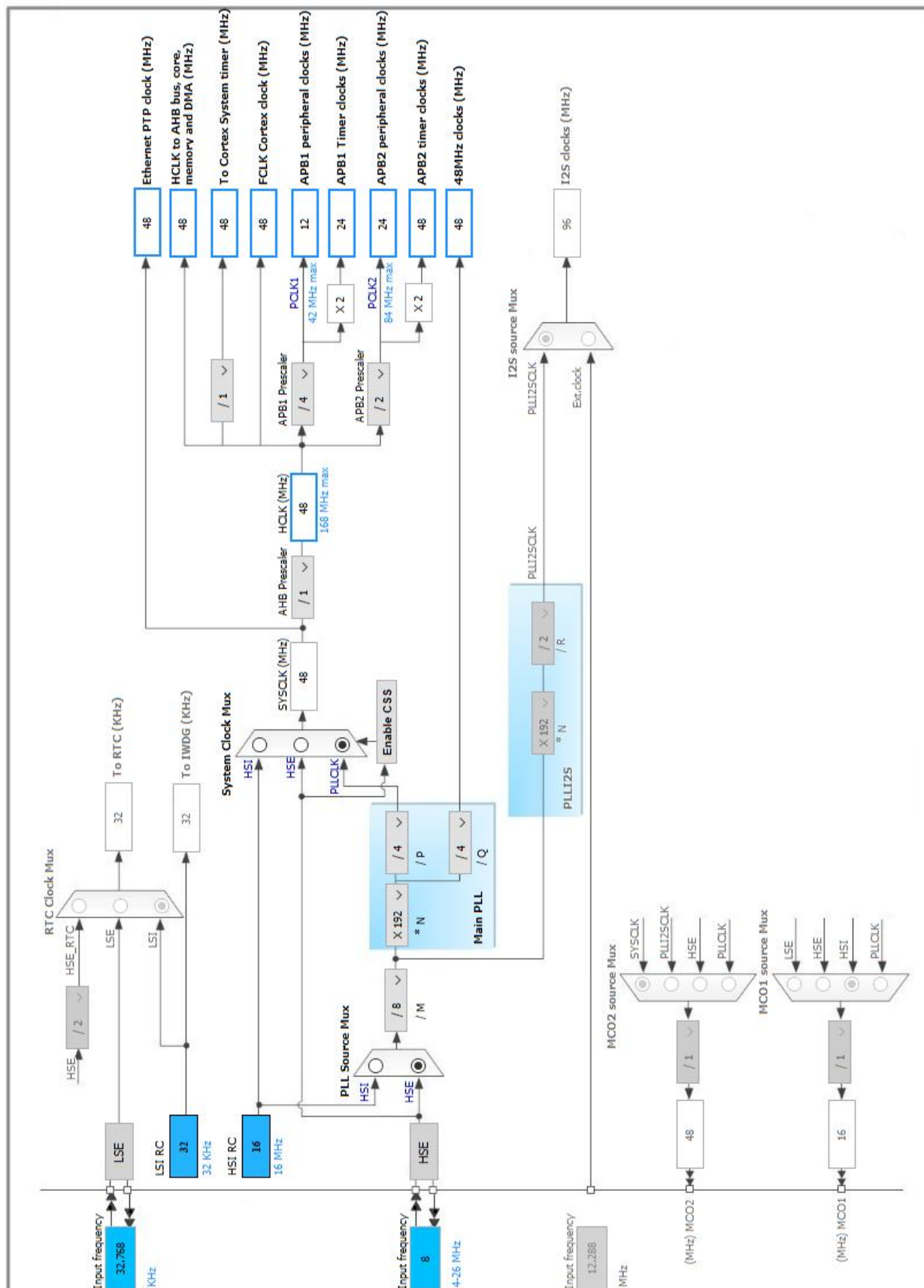
| Pin Number LQFP100 | Pin Name (function after reset) | Pin Type | Alternate Function(s) | Label |
|-----------------------|---------------------------------------|----------|--------------------------|-------------------------------------|
| 2 | PE3 * | I/O | GPIO_Output | CS_I2C/SPI [LIS302DL_CS_I2C/SPI] |
| 6 | VBAT | Power | | |
| 8 | PC14-OSC32_IN | I/O | RCC_OSC32_IN | PC14-OSC32_IN |
| 9 | PC15-OSC32_OUT | I/O | RCC_OSC32_OUT | PC15-OSC32_OUT |
| 10 | VSS | Power | | |
| 11 | VDD | Power | | |
| 12 | PH0-OSC_IN | I/O | RCC_OSC_IN | PH0-OSC_IN |
| 13 | PH1-OSC_OUT | I/O | RCC_OSC_OUT | PH1-OSC_OUT |
| 14 | NRST | Reset | | |
| 15 | PC0 * | I/O | GPIO_Output | OTG_FS_PowerSwitchOn |
| 18 | PC3 ** | I/O | I2S2_SD | PDM_OUT [MP45DT02_DOUT] |
| 19 | VDD | Power | | |
| 20 | VSSA | Power | | |
| 21 | VREF+ | Power | | |
| 22 | VDDA | Power | | |
| 23 | PA0-WKUP | I/O | GPIO_EXTI0 | B1 [Blue PushButton] |
| 27 | VSS | Power | | |
| 28 | VDD | Power | | |
| 29 | PA4 ** | I/O | I2S3_WS | I2S3_WS [CS43L22_LRCK] |
| 30 | PA5 ** | I/O | SPI1_SCK | SPI1_SCK [LIS302DL_SCL/SPC] |
| 31 | PA6 ** | I/O | SPI1_MISO | SPI1_MISO [LIS302DL_SDO] |
| 32 | PA7 ** | I/O | SPI1_MOSI | SPI1_MOSI [LIS302DL_SDA/SDI/SDO] |
| 35 | PB0 | I/O | TIM1_CH2N | |
| 36 | PB1 | I/O | TIM1_CH3N | |
| 37 | PB2 * | I/O | GPIO_Input | BOOT1 |
| 39 | PE8 | I/O | TIM1_CH1N | |
| 40 | PE9 | I/O | TIM1_CH1 | |
| 42 | PE11 | I/O | TIM1_CH2 | |
| 44 | PE13 | I/O | TIM1_CH3 | |
| 46 | PE15 | I/O | TIM1_BKIN | |
| 47 | PB10 ** | I/O | I2S2_CK | CLK_IN [MP45DT02_CLK] |
| 49 | VCAP_1 | Power | | |

| Pin Number LQFP100 | Pin Name (function after reset) | Pin Type | Alternate Function(s) | Label |
|-----------------------|---------------------------------------|----------|--------------------------|------------------------------|
| 50 | VDD | Power | | |
| 59 | PD12 * | I/O | GPIO_Output | LD4 [Green Led] |
| 60 | PD13 * | I/O | GPIO_Output | LD3 [Orange Led] |
| 61 | PD14 * | I/O | GPIO_Output | LD5 [Red Led] |
| 62 | PD15 * | I/O | GPIO_Output | LD6 [Blue Led] |
| 64 | PC7 ** | I/O | I2S3_MCK | I2S3_MCK [CS43L22_MCLK] |
| 65 | PC8 | I/O | TIM8_CH3 | |
| 68 | PA9 ** | I/O | USB_OTG_FS_VBUS | VBUS_FS |
| 69 | PA10 ** | I/O | USB_OTG_FS_ID | OTG_FS_ID |
| 70 | PA11 | I/O | USB_OTG_FS_DM | OTG_FS_DM |
| 71 | PA12 | I/O | USB_OTG_FS_DP | OTG_FS_DP |
| 72 | PA13 ** | I/O | SYS_JTMS-SWDIO | SWDIO |
| 73 | VCAP_2 | Power | | |
| 74 | VSS | Power | | |
| 75 | VDD | Power | | |
| 76 | PA14 ** | I/O | SYS_JTCK-SWCLK | SWCLK |
| 78 | PC10 ** | I/O | I2S3_CK | I2S3_SCK [CS43L22_SCLK] |
| 80 | PC12 ** | I/O | I2S3_SD | I2S3_SD [CS43L22_SDIN] |
| 85 | PD4 * | I/O | GPIO_Output | Audio_RST [CS43L22_RESET] |
| 86 | PD5 * | I/O | GPIO_Input | OTG_FS_OverCurrent |
| 89 | PB3 ** | I/O | SYS_JTDO-SWO | SWO |
| 92 | PB6 ** | I/O | I2C1_SCL | Audio_SCL [CS43L22_SCL] |
| 94 | BOOT0 | Boot | | |
| 96 | PB9 ** | I/O | I2C1_SDA | Audio_SDA [CS43L22_SDA] |
| 98 | PE1 | I/O | GPIO_EXTI1 | MEMS_INT2 [LIS302DL_INT2] |
| 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. IPs and Middleware Configuration

5.1. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

Low Speed Clock (LSE) : Crystal/Ceramic Resonator

5.1.1. Parameter Settings:

System Parameters:

| | |
|-------------------|--------------------|
| VDD voltage (V) | 3.3 |
| Instruction Cache | Enabled |
| Prefetch Buffer | Enabled |
| Data Cache | Enabled |
| Flash Latency(WS) | 1 WS (2 CPU cycle) |

RCC Parameters:

| | |
|--------------------------------|------|
| HSI Calibration Value | 16 |
| HSE Startup Timeout Value (ms) | 100 |
| LSE Startup Timeout Value (ms) | 5000 |

Power Parameters:

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

5.2. SYS

Timebase Source: TIM6

5.3. TIM1

Clock Source : Internal Clock

Channel1: PWM Generation CH1 CH1N

Channel2: PWM Generation CH2 CH2N

Channel3: PWM Generation CH3 CH3N

mode: Activate-Break-Input

5.3.1. 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 |

Trigger Output (TRGO) Parameters:

| | |
|-------------------------|--|
| Master/Slave Mode | Disable (no sync between this TIM (Master) and its Slaves) |
| Trigger Event Selection | Reset (UG bit from TIMx_EGR) |

Break And Dead Time management - BRK Configuration:

| | |
|--------------|--------|
| BRK State | Enable |
| BRK Polarity | High |

Break And Dead Time management - Output Configuration:

| | |
|--|---------|
| Automatic Output State | Disable |
| Off State Selection for Run Mode (OSSR) | Disable |
| Off State Selection for Idle Mode (OSSI) | Disable |
| Lock Configuration | Off |
| Dead Time | 0 |

PWM Generation Channel 1 and 1N:

| | |
|-----------------------|------------|
| Mode | PWM mode 1 |
| Pulse (16 bits value) | 0 |
| Fast Mode | Disable |
| CH Polarity | High |
| CHN Polarity | High |
| CH Idle State | Reset |
| CHN Idle State | Reset |

PWM Generation Channel 2 and 2N:

| | |
|-----------------------|------------|
| Mode | PWM mode 1 |
| Pulse (16 bits value) | 0 |
| Fast Mode | Disable |
| CH Polarity | High |
| CHN Polarity | High |
| CH Idle State | Reset |
| CHN Idle State | Reset |

PWM Generation Channel 3 and 3N:

| | |
|-----------------------|------------|
| Mode | PWM mode 1 |
| Pulse (16 bits value) | 0 |
| Fast Mode | Disable |
| CH Polarity | High |
| CHN Polarity | High |
| CH Idle State | Reset |
| CHN Idle State | Reset |

5.4. TIM8

Channel3: PWM Generation CH3

5.4.1. 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 |

Trigger Output (TRGO) Parameters:

| | |
|-------------------------|--|
| Master/Slave Mode | Disable (no sync between this TIM (Master) and its Slaves) |
| Trigger Event Selection | Reset (UG bit from TIMx_EGR) |

Break And Dead Time management - BRK Configuration:

| | |
|--------------|---------|
| BRK State | Disable |
| BRK Polarity | High |

Break And Dead Time management - Output Configuration:

| | |
|--|---------|
| Automatic Output State | Disable |
| Off State Selection for Run Mode (OSSR) | Disable |
| Off State Selection for Idle Mode (OSSI) | Disable |
| Lock Configuration | Off |

PWM Generation Channel 3:

| | |
|-----------------------|------------|
| Mode | PWM mode 1 |
| Pulse (16 bits value) | 0 |
| Fast Mode | Disable |
| CH Polarity | High |
| CH Idle State | Reset |

5.5. USB_OTG_FS

Mode: Device_Only

5.5.1. Parameter Settings:

| | |
|----------------------------|----------------------------|
| Speed | Device Full Speed 12MBit/s |
| Endpoint 0 Max Packet size | 64 Bytes |

| | |
|------------------------|----------|
| Enable internal IP DMA | Disabled |
| Low power | Disabled |
| Link Power Management | Disabled |
| VBUS sensing | Enabled |
| Signal start of frame | Disabled |

5.6. FREERTOS

mode: Enabled

5.6.1. Config parameters:

Versions:

| | |
|--------------------|-------|
| FreeRTOS version | 9.0.0 |
| CMSIS-RTOS version | 1.02 |

Kernel settings:

| | |
|-----------------------------------|-----------------|
| USE_PREEMPTION | Enabled |
| CPU_CLOCK_HZ | SystemCoreClock |
| TICK_RATE_HZ | 1000 |
| MAX_PRIORITIES | 7 |
| MINIMAL_STACK_SIZE | 128 |
| 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 | Disabled |
| USE_TICKLESS_IDLE | Disabled |
| USE_TASK_NOTIFICATIONS | Enabled |

Memory management settings:

| | |
|--------------------------|---------|
| Memory Allocation | Dynamic |
| TOTAL_HEAP_SIZE | 15360 |
| Memory Management scheme | heap_4 |

Hook function related definitions:

| | |
|------------------------|----------|
| USE_IDLE_HOOK | Disabled |
| USE_TICK_HOOK | Disabled |
| USE_MALLOC_FAILED_HOOK | Disabled |

| | |
|------------------------------|----------|
| USE_DAEMON_TASK_STARTUP_HOOK | Disabled |
| CHECK_FOR_STACK_OVERFLOW | Disabled |

Run time and task stats gathering related definitions:

| | |
|-------------------------|----------|
| USE_TRACE_FACILITY | Enabled |
| GENERATE_RUN_TIME_STATS | 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 |

5.6.2. 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 | Disabled |
| xTaskGetCurrentTaskHandle | Disabled |
| eTaskGetState | Disabled |
| xEventGroupSetBitFromISR | Disabled |
| xTimerPendFunctionCall | Disabled |
| xTaskAbortDelay | Disabled |
| xTaskGetHandle | Disabled |

5.7. USB_DEVICE

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

5.7.1. Parameter Settings:

Basic Parameters:

| | |
|--|---------------------|
| VirtualMode | Cdc |
| 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 |

Class Parameters:

| | |
|---|------|
| USBD_CDC_INTERVAL (Number of micro-frames interval) | 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 |
|-----------------------|----------------|-----------------|------------------------------|-----------------------------|-----------|----------------------------------|
| RCC | PC14-OSC32_IN | RCC_OSC32_IN | n/a | n/a | n/a | PC14-OSC32_IN |
| | PC15-OSC32_OUT | RCC_OSC32_OUT | n/a | n/a | n/a | PC15-OSC32_OUT |
| | PH0-OSC_IN | RCC_OSC_IN | n/a | n/a | n/a | PH0-OSC_IN |
| | PH1-OSC_OUT | RCC_OSC_OUT | n/a | n/a | n/a | PH1-OSC_OUT |
| TIM1 | PB0 | TIM1_CH2N | Alternate Function Push Pull | No pull-up and no pull-down | Low | |
| | PB1 | TIM1_CH3N | Alternate Function Push Pull | No pull-up and no pull-down | Low | |
| | PE8 | TIM1_CH1N | Alternate Function Push Pull | No pull-up and no pull-down | Low | |
| | PE9 | TIM1_CH1 | Alternate Function Push Pull | No pull-up and no pull-down | Low | |
| | PE11 | TIM1_CH2 | Alternate Function Push Pull | No pull-up and no pull-down | Low | |
| | PE13 | TIM1_CH3 | Alternate Function Push Pull | No pull-up and no pull-down | Low | |
| | PE15 | TIM1_BKIN | Alternate Function Push Pull | No pull-up and no pull-down | Low | |
| TIM8 | PC8 | TIM8_CH3 | Alternate Function Push Pull | No pull-up and no pull-down | Low | |
| USB_OTG_FS | PA11 | USB_OTG_FS_DM | Alternate Function Push Pull | No pull-up and no pull-down | Low | OTG_FS_DM |
| | PA12 | USB_OTG_FS_DP | Alternate Function Push Pull | No pull-up and no pull-down | Low | OTG_FS_DP |
| Single Mapped Signals | PC3 | I2S2_SD | Alternate Function Push Pull | No pull-up and no pull-down | Low | PDM_OUT [MP45DT02_DOUT] |
| | PA4 | I2S3_WS | Alternate Function Push Pull | No pull-up and no pull-down | Low | I2S3_WS [CS43L22_LRCK] |
| | PA5 | SPI1_SCK | Alternate Function Push Pull | No pull-up and no pull-down | Low | SPI1_SCK [LIS302DL_SCL/SPC] |
| | PA6 | SPI1_MISO | Alternate Function Push Pull | No pull-up and no pull-down | Low | SPI1_MISO [LIS302DL_SDO] |
| | PA7 | SPI1_MOSI | Alternate Function Push Pull | No pull-up and no pull-down | Low | SPI1_MOSI [LIS302DL_SDA/SDI/SDO] |
| | PB10 | I2S2_CK | Alternate Function Push Pull | No pull-up and no pull-down | Low | CLK_IN [MP45DT02_CLK] |
| | PC7 | I2S3_MCK | Alternate Function Push Pull | No pull-up and no pull-down | Low | I2S3_MCK [CS43L22_MCLK] |
| | PA9 | USB_OTG_FS_VBUS | Input mode | No pull-up and no pull-down | n/a | VBUS_FS |
| | PA10 | USB_OTG_FS_ID | Alternate Function Push Pull | No pull-up and no pull-down | Low | OTG_FS_ID |

| IP | Pin | Signal | GPIO mode | GPIO pull/up pull down | Max Speed | User Label |
|------|----------|----------------|---|-----------------------------|-----------|-------------------------------------|
| | | D | | | | |
| | PA13 | SYS_JTMS-SWDIO | n/a | n/a | n/a | SWDIO |
| | PA14 | SYS_JTCK-SWCLK | n/a | n/a | n/a | SWCLK |
| | PC10 | I2S3_CK | Alternate Function Push Pull | No pull-up and no pull-down | Low | I2S3_SCK [CS43L22_SCLK] |
| | PC12 | I2S3_SD | Alternate Function Push Pull | No pull-up and no pull-down | Low | I2S3_SD [CS43L22_SDIN] |
| | PB3 | SYS_JTDO-SWO | n/a | n/a | n/a | SWO |
| | PB6 | I2C1_SCL | Alternate Function Open Drain | Pull-up | Low | Audio_SCL [CS43L22_SCL] |
| | PB9 | I2C1_SDA | Alternate Function Open Drain | Pull-up | Low | Audio_SDA [CS43L22_SDA] |
| GPIO | PE3 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | CS_I2C/SPI [LIS302DL_CS_I2C/SPI] |
| | PC0 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | OTG_FS_PowerSwitchOn |
| | PA0-WKUP | GPIO_EXTI0 | External Interrupt Mode with Rising edge trigger detection | No pull-up and no pull-down | n/a | B1 [Blue PushButton] |
| | PB2 | GPIO_Input | Input mode | No pull-up and no pull-down | n/a | BOOT1 |
| | PD12 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | LD4 [Green Led] |
| | PD13 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | LD3 [Orange Led] |
| | PD14 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | LD5 [Red Led] |
| | PD15 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | LD6 [Blue Led] |
| | PD4 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | Audio_RST [CS43L22_RESET] |
| | PD5 | GPIO_Input | Input mode | No pull-up and no pull-down | n/a | OTG_FS_OverCurrent |
| | PE1 | GPIO_EXTI1 | External Event Mode with Rising edge trigger detection * | No pull-up and no pull-down | n/a | MEMS_INT2 [LIS302DL_INT2] |

6.2. DMA configuration

nothing configured in DMA service

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 |
| 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 |
| TIM6 global interrupt, DAC1 and DAC2 underrun error interrupts | 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 | | |
| EXTI line0 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 | | |
| TIM8 break interrupt and TIM12 global interrupt | unused | | |
| TIM8 update interrupt and TIM13 global interrupt | unused | | |
| TIM8 trigger and commutation interrupts and TIM14 global interrupt | unused | | |
| TIM8 capture compare interrupt | unused | | |
| FPU global interrupt | unused | | |

* User modified value

7. Power Consumption Calculator report

7.1. Microcontroller Selection

| | |
|-----------|---------------|
| Series | STM32F4 |
| Line | STM32F407/417 |
| MCU | STM32F407VGTx |
| Datasheet | 022152_Rev7 |

7.2. Parameter Selection

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

8. Software Project

8.1. Project Settings

| Name | Value |
|-----------------------------------|---------------------------------|
| Project Name | STM32F4T1 |
| Project Folder | F:\STM32\workspace_f4\STM32F4T1 |
| Toolchain / IDE | SW4STM32 |
| Firmware Package Name and Version | STM32Cube FW_F4 V1.16.0 |

8.2. 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 | Yes |
| 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 |