

1. Description

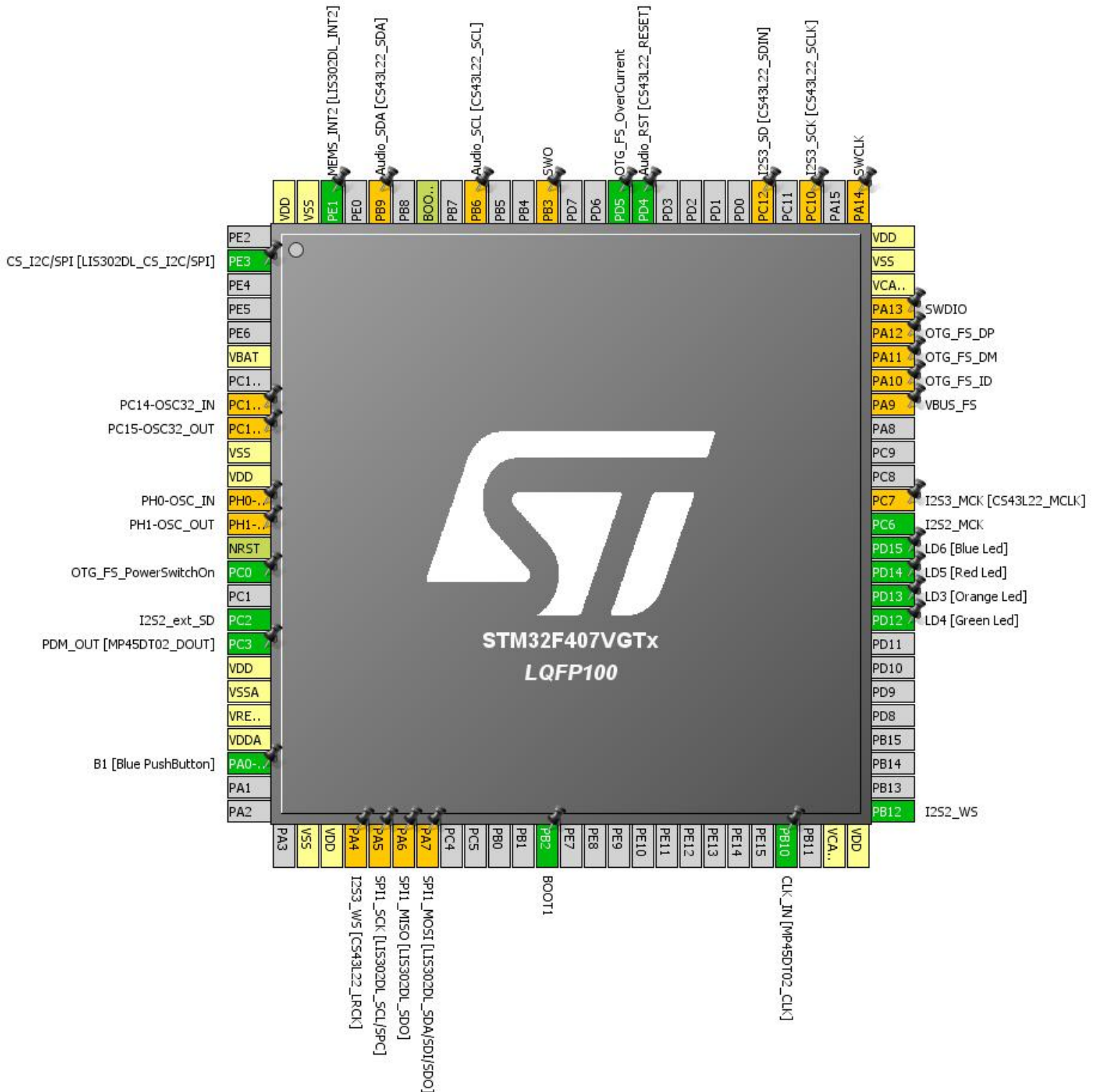
1.1. Project

| | |
|-----------------|--------------------|
| Project Name | FM_transmitter |
| Board Name | STM32F4DISCOVERY |
| Generated with: | STM32CubeMX 4.16.0 |
| Date | 09/15/2016 |

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

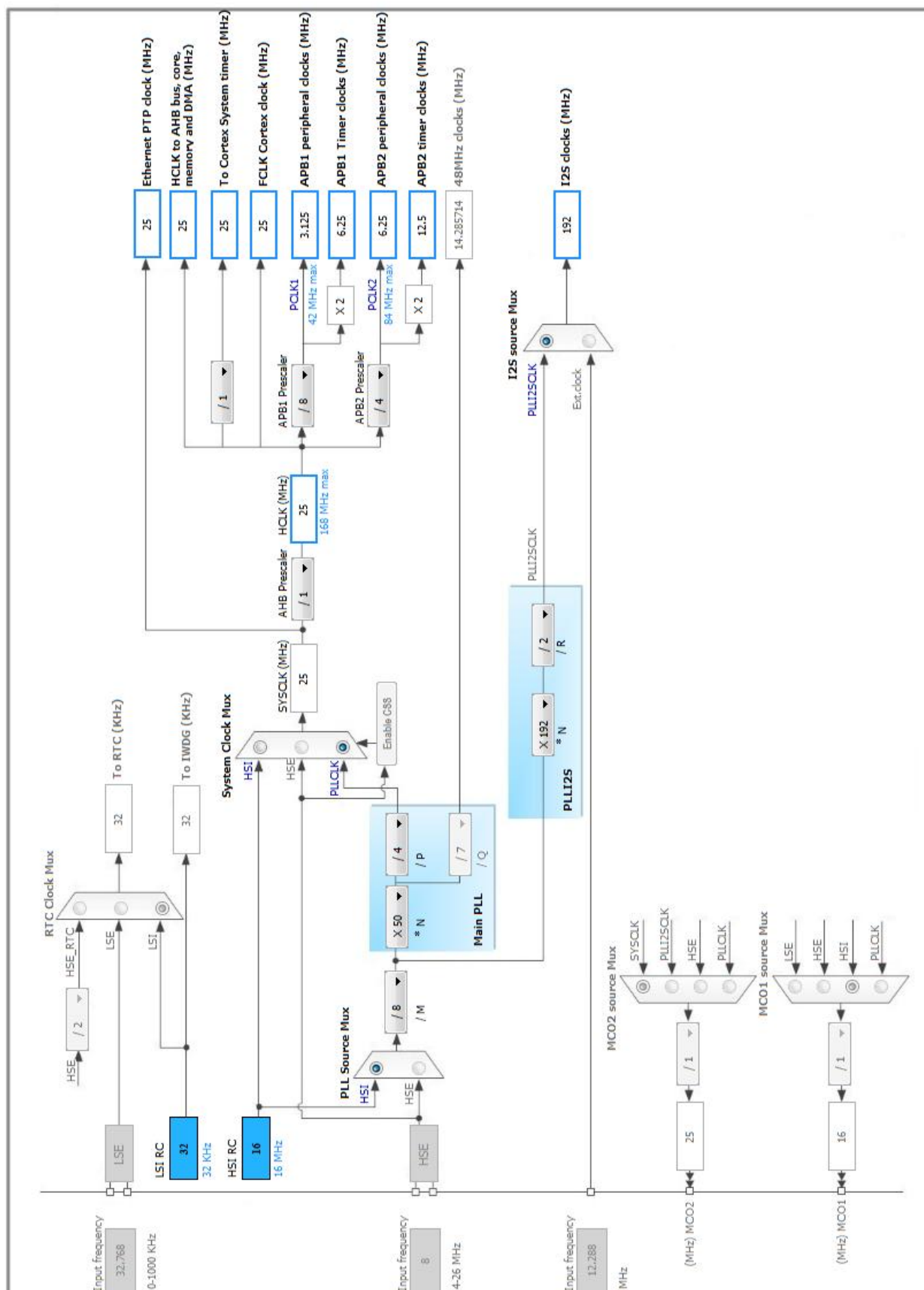
| Pin Number LQFP100 | Pin Name (function after reset) | Pin Type | Alternate Function(s) | Label |
|-----------------------|---------------------------------------|----------|--------------------------|-------------------------------------|
| 2 | PE3 * | I/O | GPIO_Output | CS_I2C/SPI [LIS302DL_CS_I2C/SPI] |
| 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 |
| 17 | PC2 | I/O | I2S2_ext_SD | |
| 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] |
| 37 | PB2 * | I/O | GPIO_Input | BOOT1 |
| 47 | PB10 | I/O | I2S2_CK | CLK_IN [MP45DT02_CLK] |
| 49 | VCAP_1 | Power | | |
| 50 | VDD | Power | | |
| 51 | PB12 | I/O | I2S2_WS | |
| 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] |

| Pin Number LQFP100 | Pin Name (function after reset) | Pin Type | Alternate Function(s) | Label |
|-----------------------|---------------------------------------|----------|--------------------------|------------------------------|
| 63 | PC6 | I/O | I2S2_MCK | |
| 64 | PC7 ** | I/O | I2S3_MCK | I2S3_MCK [CS43L22_MCLK] |
| 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. I2S2

Mode: Full-Duplex Master

mode: Master Clock Output

5.1.1. Parameter Settings:

Generic Parameters:

| | |
|---------------------------------|-------------------------------|
| Transmission Mode | Mode Master Receive * |
| Communication Standard | I2S Philips |
| Data and Frame Format | 16 Bits Data on 16 Bits Frame |
| Selected Audio Frequency | 192 KHz |
| Real Audio Frequency | 187.5 KHz * |
| Error between Selected and Real | -2.34 % * |

Clock Parameters:

| | |
|----------------|---------------|
| Clock Source | I2S PLL Clock |
| Clock Polarity | Low |

5.2. SYS

Timebase Source: SysTick

* User modified value

6. System Configuration

6.1. GPIO configuration

| IP | Pin | Signal | GPIO mode | GPIO pull/up pull down | Max Speed | User Label |
|-----------------------|----------------|-----------------|------------------------------|-----------------------------|-----------|-------------------------------------|
| I2S2 | PC2 | I2S2_ext_SD | Alternate Function Push Pull | No pull-up and no pull-down | Low | |
| | PC3 | I2S2_SD | Alternate Function Push Pull | No pull-up and no pull-down | Low | PDM_OUT [MP45DT02_DOUT] |
| | PB10 | I2S2_CK | Alternate Function Push Pull | No pull-up and no pull-down | Low | CLK_IN [MP45DT02_CLK] |
| | PB12 | I2S2_WS | Alternate Function Push Pull | No pull-up and no pull-down | Low | |
| | PC6 | I2S2_MCK | Alternate Function Push Pull | No pull-up and no pull-down | Low | |
| Single Mapped Signals | 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 |
| | 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] |
| | 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 |
| | 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 |
| | PA13 | SYS_JTMS-SWDIO | n/a | n/a | n/a | SWDIO |
| | PA14 | SYS_JTCK-SWCLK | n/a | n/a | n/a | SWCLK |
| | | | | | | |

| IP | Pin | Signal | GPIO mode | GPIO pull/up pull down | Max Speed | User Label |
|------|----------|--------------|---|-----------------------------|-----------|-------------------------------------|
| | 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 Event 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 | 0 | 0 |
| System tick timer | true | 0 | 0 |
| PVD interrupt through EXTI line 16 | unused | | |
| Flash global interrupt | unused | | |
| RCC global interrupt | unused | | |
| SPI2 global 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 | FM_transmitter |
| Project Folder | C:\Users\Agustin\Documents\Workspace_STM\FM_transmitter |
| Toolchain / IDE | MDK-ARM V5 |
| Firmware Package Name and Version | STM32Cube FW_F4 V1.13.0 |

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 |