



1. Description

1.1. Project

| | |
|-----------------|-------------------|
| Project Name | NucleoF411-SPI |
| Board Name | NUCLEO-F411RE |
| Generated with: | STM32CubeMX 6.2.1 |
| Date | 05/10/2021 |

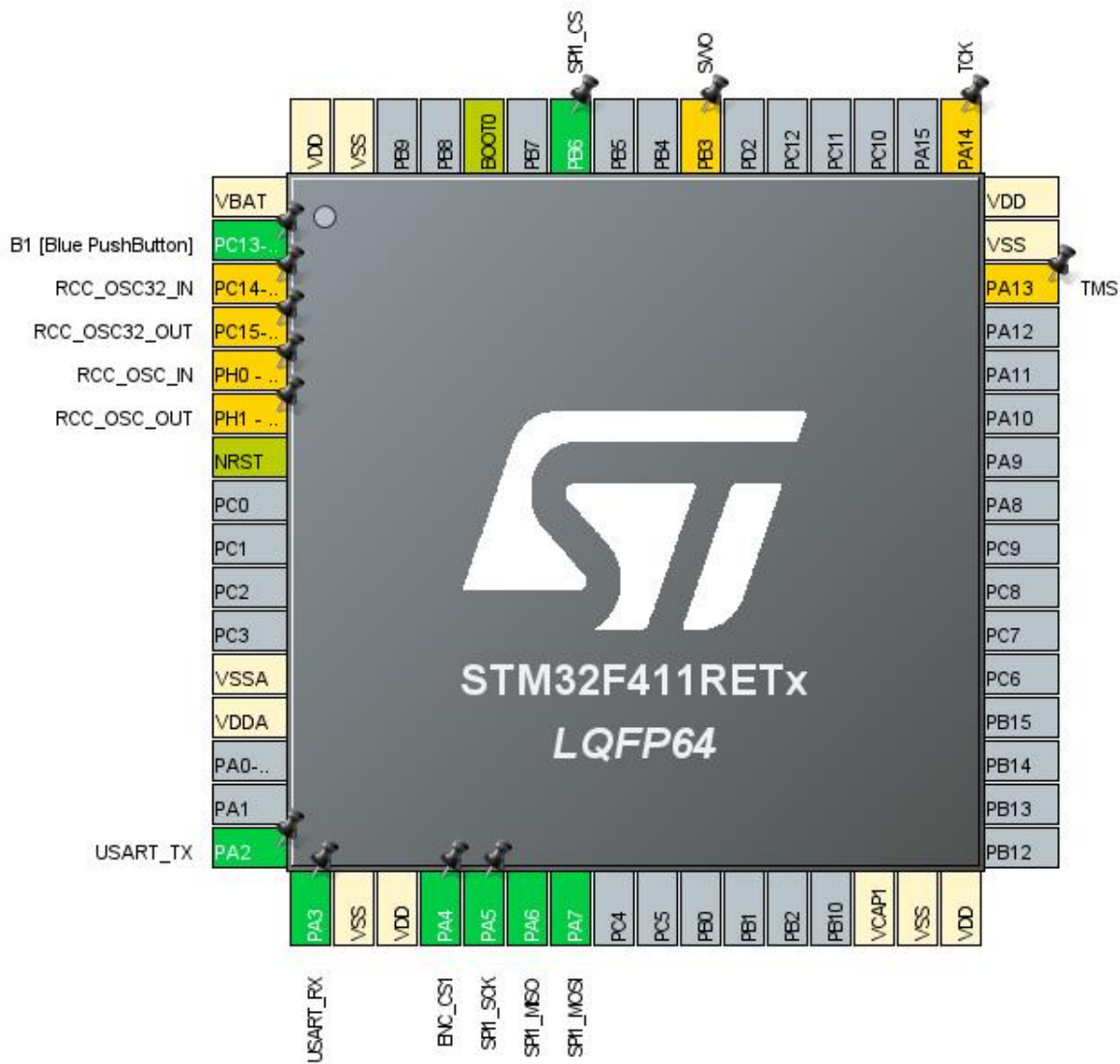
1.2. MCU

| | |
|----------------|---------------|
| MCU Series | STM32F4 |
| MCU Line | STM32F411 |
| MCU name | STM32F411RETx |
| MCU Package | LQFP64 |
| MCU Pin number | 64 |

1.3. Core(s) information

| | |
|---------|---------------|
| Core(s) | Arm Cortex-M4 |
|---------|---------------|

2. Pinout Configuration



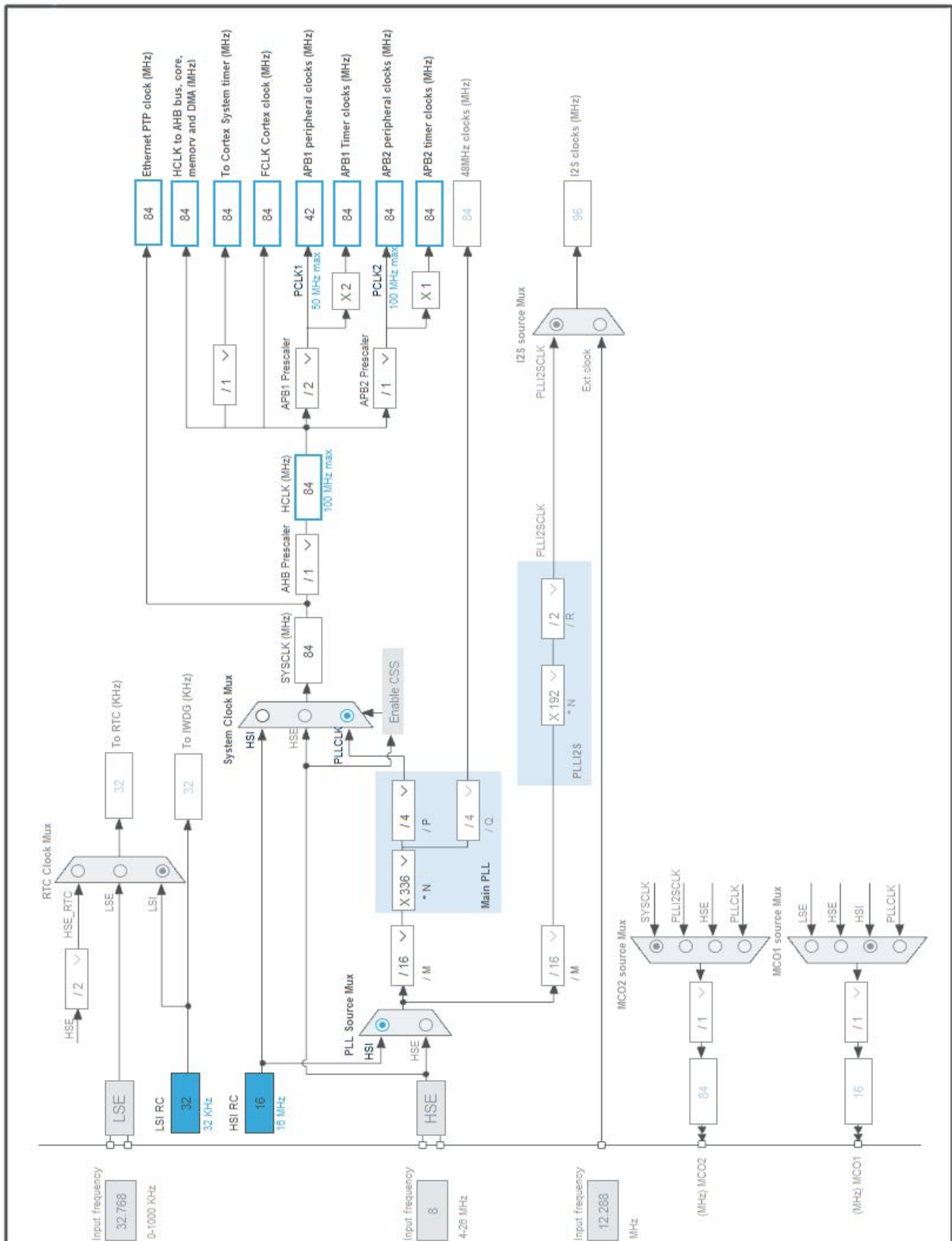
3. Pins Configuration

| Pin Number LQFP64 | Pin Name (function after reset) | Pin Type | Alternate Function(s) | Label |
|----------------------|---------------------------------------|----------|--------------------------|----------------------|
| 1 | VBAT | Power | | |
| 2 | PC13-ANTI_TAMP | I/O | GPIO_EXTI13 | B1 [Blue PushButton] |
| 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 | | |
| 12 | VSSA | Power | | |
| 13 | VDDA | Power | | |
| 16 | PA2 | I/O | USART2_TX | USART_TX |
| 17 | PA3 | I/O | USART2_RX | USART_RX |
| 18 | VSS | Power | | |
| 19 | VDD | Power | | |
| 20 | PA4 ** | I/O | GPIO_Output | ENC_CS1 |
| 21 | PA5 | I/O | SPI1_SCK | |
| 22 | PA6 | I/O | SPI1_MISO | |
| 23 | PA7 | I/O | SPI1_MOSI | |
| 30 | VCAP1 | Power | | |
| 31 | VSS | Power | | |
| 32 | VDD | Power | | |
| 46 | PA13 * | I/O | SYS_JTMS-SWDIO | TMS |
| 47 | VSS | Power | | |
| 48 | VDD | Power | | |
| 49 | PA14 * | I/O | SYS_JTCK-SWCLK | TCK |
| 55 | PB3 * | I/O | SYS_JTDO-SWO | SWO |
| 58 | PB6 ** | I/O | GPIO_Output | SPI1_CS |
| 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 | NucleoF411-SPI |
| Project Folder | D:\30_ARM_WS\CompleteProject\NucleoF411-SPI_DMA |
| Toolchain / IDE | SW4STM32 |
| Firmware Package Name and Version | STM32Cube FW_F4 V1.26.1 |
| Application Structure | Basic |
| Generate Under Root | Yes |
| Do not generate the main() | No |
| Minimum Heap Size | 0x200 |
| Minimum Stack Size | 0x400 |

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 | No |
| Backup previously generated files when re-generating | Yes |
| Keep User Code 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 |
| Enable Full Assert | No |

5.3. Advanced Settings - Generated Function Calls

| Rank | Function Name | Peripheral Instance Name |
|------|---------------------|--------------------------|
| 1 | MX_GPIO_Init | GPIO |
| 2 | MX_DMA_Init | DMA |
| 3 | SystemClock_Config | RCC |
| 4 | MX_SPI1_Init | SPI1 |
| 5 | MX_USART2_UART_Init | USART2 |

6. Power Consumption Calculator report

6.1. Microcontroller Selection

| | |
|-----------|---------------|
| Series | STM32F4 |
| Line | STM32F411 |
| MCU | STM32F411RETx |
| Datasheet | DS10314_Rev6 |

6.2. Parameter Selection

| | |
|-------------|-----|
| Temperature | 25 |
| Vdd | 1.7 |

6.3. Battery Selection

| | |
|-------------------|-----------------|
| Battery | Li-SOCL2(A3400) |
| Capacity | 3400.0 mAh |
| Self Discharge | 0.08 %/month |
| Nominal Voltage | 3.6 V |
| Max Cont Current | 100.0 mA |
| Max Pulse Current | 200.0 mA |
| Cells in series | 1 |
| Cells in parallel | 1 |

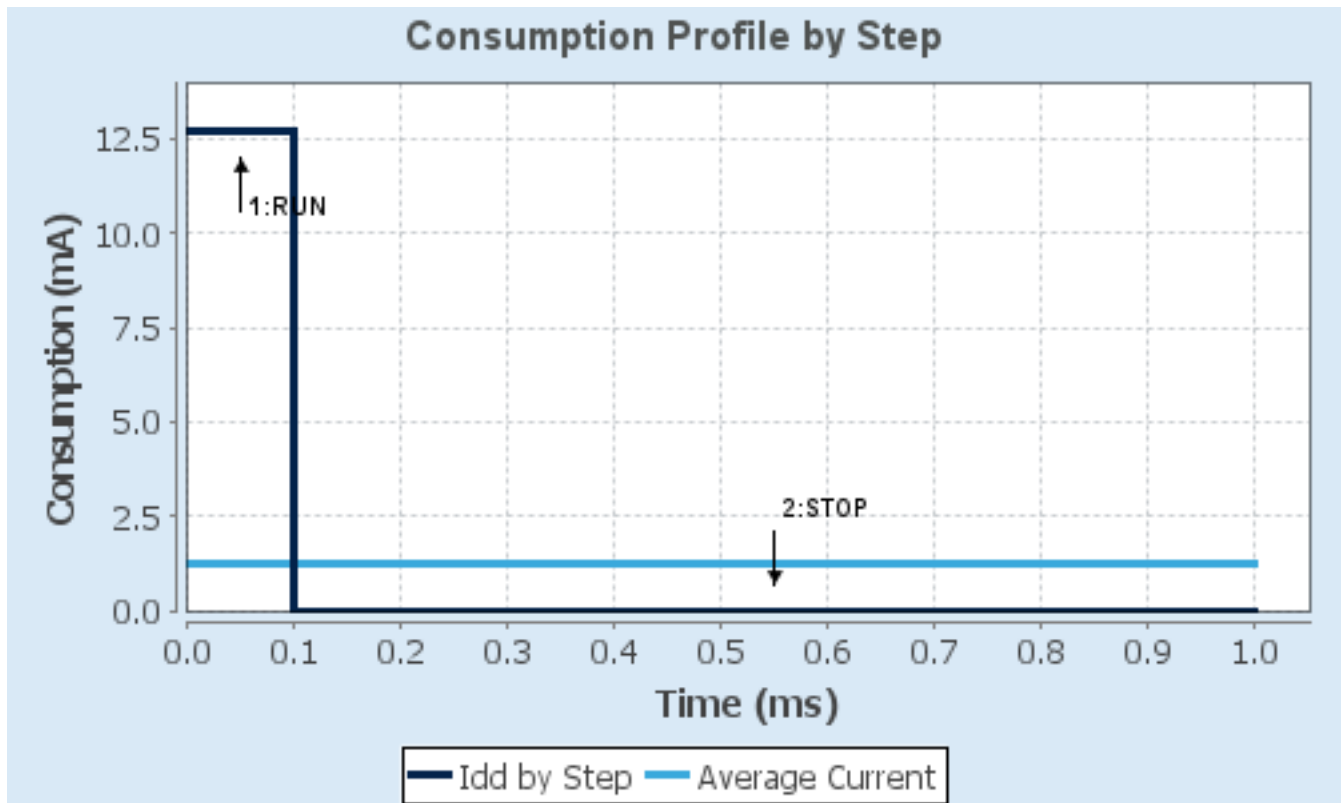
6.4. Sequence

| | | |
|-------------------------------|-------------|-----------------------------|
| Step | Step1 | Step2 |
| Mode | RUN | STOP |
| Vdd | 1.7 | 1.7 |
| Voltage Source | Battery | Battery |
| Range | Scale1-High | No Scale |
| Fetch Type | SRAM | n/a |
| CPU Frequency | 100 MHz | 0 Hz |
| Clock Configuration | HSE PLL | Regulator_LPLV Flash-PwrDwn |
| Clock Source Frequency | 4 MHz | 0 Hz |
| Peripherals | | |
| Additional Cons. | 0 mA | 0 mA |
| Average Current | 12.7 mA | 9 μ A |
| Duration | 0.1 ms | 0.9 ms |
| DMIPS | 125.0 | 0.0 |
| Ta Max | 103.99 | 105 |
| Category | In DS Table | In DS Table |

6.5. Results

| | | | |
|---------------|----------------------------|-----------------|-------------|
| Sequence Time | 1 ms | Average Current | 1.28 mA |
| Battery Life | 3 months, 19 days, 6 hours | Average DMIPS | 125.0 DMIPS |

6.6. Chart



7. Peripherals and Middlewares Configuration

7.1. RCC

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 Timeout Value (ms) | 100 |
| LSE Startup Timeout Value (ms) | 5000 |

Power Parameters:

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

7.2. SPI1

Mode: Full-Duplex Master

7.2.1. Parameter Settings:

Basic Parameters:

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

Clock Parameters:

| | |
|---------------------------|-------------------------|
| Prescaler (for Baud Rate) | 64 * |
| Baud Rate | 1.3125 MBits/s * |
| Clock Polarity (CPOL) | Low |
| Clock Phase (CPHA) | 1 Edge |

Advanced Parameters:

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

7.3. SYS

Timebase Source: SysTick

7.4. USART2

Mode: Asynchronous

7.4.1. Parameter Settings:

Basic Parameters:

| | |
|-------------|---------------------------|
| Baud Rate | 9600 * |
| Word Length | 8 Bits (including Parity) |
| Parity | None |
| Stop Bits | 1 |

Advanced Parameters:

| | |
|----------------|----------------------|
| Data Direction | Receive and Transmit |
| 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 |
|-----------------------|----------------|----------------|--|-----------------------------|--------------------|----------------------|
| SPI1 | PA5 | SPI1_SCK | Alternate Function Push Pull | Pull-up * | Very High * | |
| | PA6 | SPI1_MISO | Alternate Function Push Pull | Pull-up * | Very High * | |
| | PA7 | SPI1_MOSI | Alternate Function Push Pull | Pull-up * | Very High * | |
| USART2 | PA2 | USART2_TX | Alternate Function Push Pull | No pull-up and no pull-down | Very High * | USART_TX |
| | PA3 | USART2_RX | Alternate Function Push Pull | No pull-up and no pull-down | Very High * | USART_RX |
| Single Mapped Signals | 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 | |
| | PA13 | SYS_JTMS-SWDIO | n/a | n/a | n/a | TMS |
| | PA14 | SYS_JTCK-SWCLK | n/a | n/a | n/a | TCK |
| | PB3 | SYS_JTDO-SWO | n/a | n/a | n/a | SWO |
| GPIO | PC13-ANTI_TAMP | GPIO_EXTI13 | External Interrupt Mode with Falling edge trigger detection | No pull-up and no pull-down | n/a | B1 [Blue PushButton] |
| | PA4 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Very High * | ENC_CS1 |
| | PB6 | GPIO_Output | Output Push Pull | Pull-up * | Very High * | SPI1_CS |

8.2. DMA configuration

| DMA request | Stream | Direction | Priority |
|-------------|--------------|----------------------|----------|
| SPI1_RX | DMA2_Stream0 | Peripheral To Memory | Low |
| SPI1_TX | DMA2_Stream2 | Memory To Peripheral | Low |

SPI1_RX: DMA2_Stream0 DMA request Settings:

Mode: Normal
 Use fifo: Disable
 Peripheral Increment: Disable
 Memory Increment: **Enable ***
 Peripheral Data Width: Byte
 Memory Data Width: Byte

SPI1_TX: DMA2_Stream2 DMA request Settings:

Mode: Normal
 Use fifo: Disable
 Peripheral Increment: Disable
 Memory Increment: **Enable ***
 Peripheral Data Width: Byte
 Memory Data Width: Byte

8.3. NVIC configuration

8.3.1. NVIC

| 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 |
| SPI1 global interrupt | true | 0 | 0 |
| DMA2 stream0 global interrupt | true | 0 | 0 |
| DMA2 stream2 global interrupt | true | 0 | 0 |
| PVD interrupt through EXTI line 16 | unused | | |
| Flash global interrupt | unused | | |
| RCC global interrupt | unused | | |
| USART2 global interrupt | unused | | |
| EXTI line[15:10] interrupts | unused | | |
| FPU global interrupt | unused | | |

8.3.2. NVIC Code generation

| Enabled interrupt Table | Select for init sequence ordering | Generate IRQ handler | Call HAL handler |
|---|-----------------------------------|----------------------|------------------|
| Non maskable interrupt | false | false | false |
| Hard fault interrupt | false | false | false |
| Memory management fault | false | false | false |
| Pre-fetch fault, memory access fault | false | false | false |
| Undefined instruction or illegal state | false | false | false |
| System service call via SWI instruction | false | true | false |
| Debug monitor | false | false | false |
| Pendable request for system service | false | true | false |
| System tick timer | false | true | true |
| SPI1 global interrupt | false | true | true |
| DMA2 stream0 global interrupt | false | true | true |
| DMA2 stream2 global interrupt | false | true | true |

*** User modified value**

9. System Views

9.1. Category view

9.1.1. Current

Middleware

System Core

Analog

Timers

Connectivity

Multimedia

Computing

DMA 

GPIO 

IIVIC 

RCC 

SYS 

SPI1 

USART2 

10. Docs & Resources

| Type | Link |
|--------------------|---|
| Datasheet | http://www.st.com/resource/en/datasheet/DM00115249.pdf |
| Reference manual | http://www.st.com/resource/en/reference_manual/DM00119316.pdf |
| Programming manual | http://www.st.com/resource/en/programming_manual/DM00046982.pdf |
| Errata sheet | http://www.st.com/resource/en/errata_sheet/DM00137034.pdf |
| Application note | http://www.st.com/resource/en/application_note/CD00167594.pdf |
| Application note | http://www.st.com/resource/en/application_note/CD00211314.pdf |
| Application note | http://www.st.com/resource/en/application_note/CD00249778.pdf |
| Application note | http://www.st.com/resource/en/application_note/CD00259245.pdf |
| Application note | http://www.st.com/resource/en/application_note/CD00264321.pdf |
| Application note | http://www.st.com/resource/en/application_note/CD00264342.pdf |
| Application note | http://www.st.com/resource/en/application_note/CD00264379.pdf |
| Application note | http://www.st.com/resource/en/application_note/DM00024853.pdf |
| Application note | http://www.st.com/resource/en/application_note/DM00040802.pdf |
| Application note | http://www.st.com/resource/en/application_note/DM00040808.pdf |
| Application note | http://www.st.com/resource/en/application_note/DM00042534.pdf |
| Application note | http://www.st.com/resource/en/application_note/DM00046011.pdf |
| Application note | http://www.st.com/resource/en/application_note/DM00072315.pdf |
| Application note | http://www.st.com/resource/en/application_note/DM00073742.pdf |
| Application note | http://www.st.com/resource/en/application_note/DM00073853.pdf |
| Application note | http://www.st.com/resource/en/application_note/DM00080497.pdf |
| Application note | http://www.st.com/resource/en/application_note/DM00081379.pdf |
| Application note | http://www.st.com/resource/en/application_note/DM00115714.pdf |
| Application note | http://www.st.com/resource/en/application_note/DM00129215.pdf |
| Application note | http://www.st.com/resource/en/application_note/DM00156364.pdf |
| Application note | http://www.st.com/resource/en/application_note/DM00160482.pdf |

Application note http://www.st.com/resource/en/application_note/DM00144612.pdf
Application note http://www.st.com/resource/en/application_note/DM00213525.pdf
Application note http://www.st.com/resource/en/application_note/DM00220769.pdf
Application note http://www.st.com/resource/en/application_note/DM00257177.pdf
Application note http://www.st.com/resource/en/application_note/DM00272912.pdf
Application note http://www.st.com/resource/en/application_note/DM00226326.pdf
Application note http://www.st.com/resource/en/application_note/DM00236305.pdf
Application note http://www.st.com/resource/en/application_note/DM00281138.pdf
Application note http://www.st.com/resource/en/application_note/DM00296349.pdf
Application note http://www.st.com/resource/en/application_note/DM00325582.pdf
Application note http://www.st.com/resource/en/application_note/DM00327191.pdf
Application note http://www.st.com/resource/en/application_note/DM00354244.pdf
Application note http://www.st.com/resource/en/application_note/DM00315319.pdf
Application note http://www.st.com/resource/en/application_note/DM00380469.pdf
Application note http://www.st.com/resource/en/application_note/DM00395696.pdf
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