# 1. Description

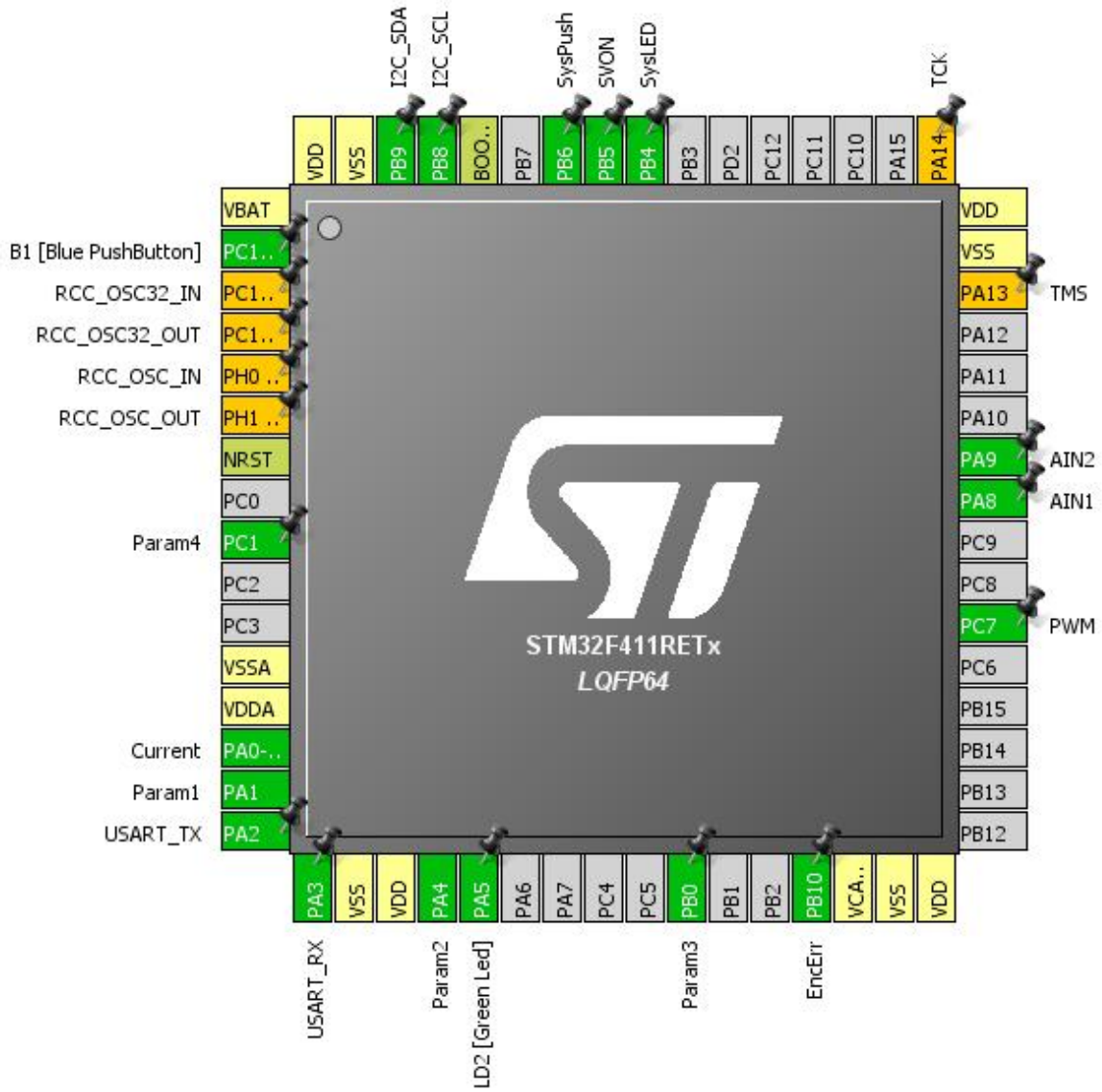
## 1.1. Project

| | |
|---|---|
| Project Name | DCMotorControlShieldV1_0 |
| Board Name | NUCLEO-F411RE |
| Generated with: | STM32CubeMX 4.22.0 |
| Date | 09/02/2017 |

## 1.2. MCU

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

# 2. Pinout Configuration



# 3. Pins Configuration

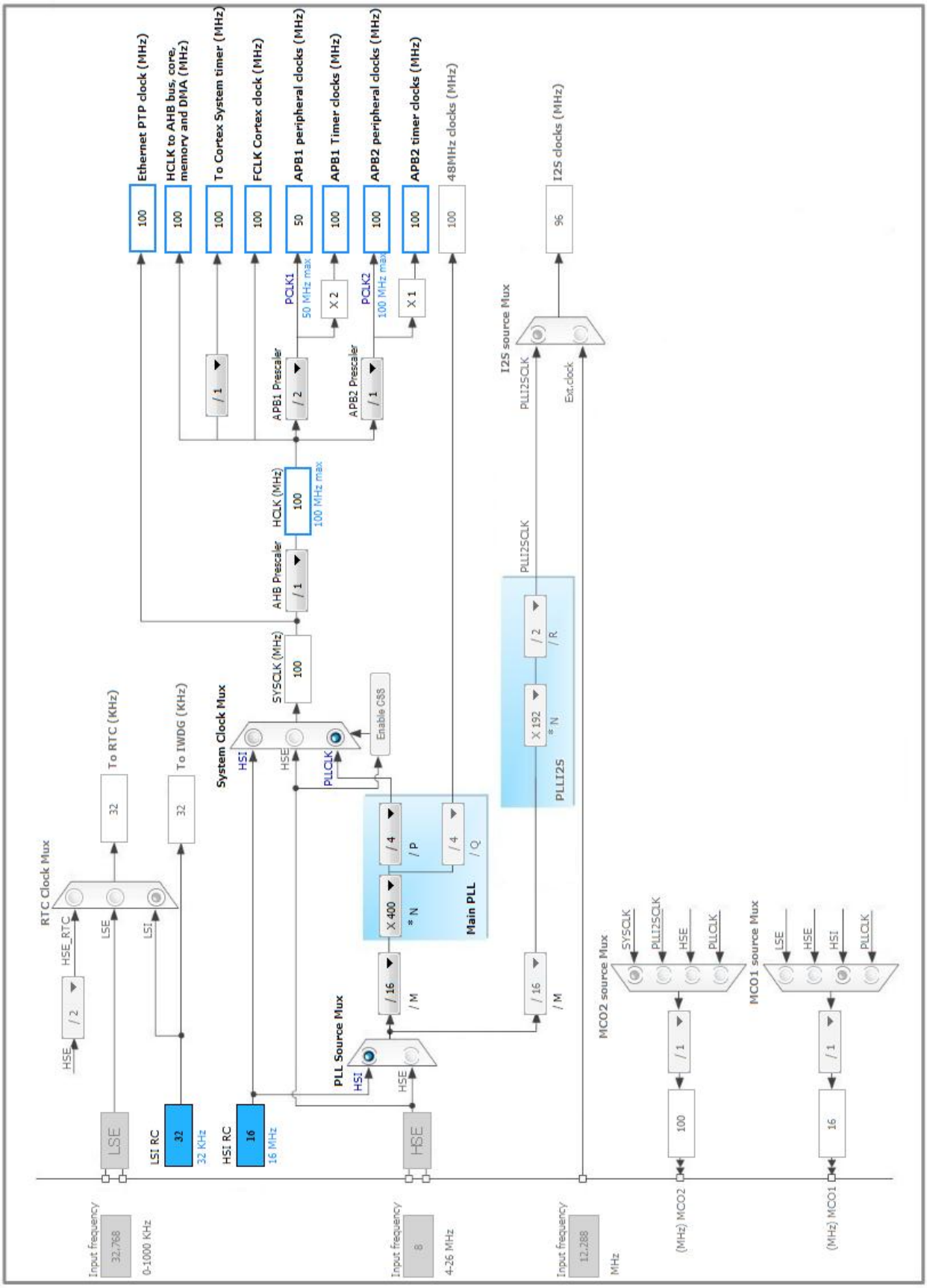
| Pin Number LQFP64 | Pin Name (function after reset) | Pin Type | Alternate Function(s) | Label |
|---|---|---|---|---|
| 1 | VBAT | Power | | |
| 2 | PC13-ANTI_TAMP | I/O | GPIO_EXTI13 | B1 [Blue PushButton] |
| 3 | PC14-OSC32_IN * | I/O | RCC_OSC32_IN | |
| 4 | PC15-OSC32_OUT * | I/O | RCC_OSC32_OUT | |
| 5 | PH0 - OSC_IN * | I/O | RCC_OSC_IN | |
| 6 | PH1 - OSC_OUT * | I/O | RCC_OSC_OUT | |
| 7 | NRST | Reset | | |
| 9 | PC1 | I/O | ADC1_IN11 | Param4 |
| 12 | VSSA | Power | | |
| 13 | VDDA | Power | | |
| 14 | PA0-WKUP | I/O | ADC1_IN0 | Current |
| 15 | PA1 | I/O | ADC1_IN1 | Param1 |
| 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 | ADC1_IN4 | Param2 |
| 21 | PA5 ** | I/O | GPIO_Output | LD2 [Green Led] |
| 26 | PB0 | I/O | ADC1_IN8 | Param3 |
| 29 | PB10 ** | I/O | GPIO_Output | EncErr |
| 30 | VCAP1 | Power | | |
| 31 | VSS | Power | | |
| 32 | VDD | Power | | |
| 38 | PC7 | I/O | TIM3_CH2 | PWM |
| 41 | PA8 ** | I/O | GPIO_Output | AIN1 |
| 42 | PA9 ** | I/O | GPIO_Output | AIN2 |
| 46 | PA13 * | I/O | SYS_JTMS-SWDIO | TMS |
| 47 | VSS | Power | | |
| 48 | VDD | Power | | |
| 49 | PA14 * | I/O | SYS_JTCK-SWCLK | TCK |
| 56 | PB4 ** | I/O | GPIO_Output | SysLED |
| 57 | PB5 ** | I/O | GPIO_Input | SVON |
| 58 | PB6 ** | I/O | GPIO_Input | SysPush |
| 60 | BOOT0 | Boot | | |
| 61 | PB8 | I/O | I2C1_SCL | I2C_SCL |
| 62 | PB9 | I/O | I2C1_SDA | I2C_SDA |

| Pin Number LQFP64 | Pin Name (function after reset) | Pin Type | Alternate Function(s) | Label |
|---|---|---|---|---|
| 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. IPs and Middleware Configuration

## 5.1. ADC1

**mode: IN0**

**mode: IN1**

**mode: IN4**

**mode: IN8**

**mode: IN11**

### 5.1.1. Parameter Settings:

| | |
|---|---|
| **ADC_Settings:** | |
| Clock Prescaler | PCLK2 divided by 4 |
| Resolution | 12 bits (15 ADC Clock cycles) |
| Data Alignment | Right alignment |
| Scan Conversion Mode | **Enabled *** |
| Continuous Conversion Mode | Disabled |
| Discontinuous Conversion Mode | Disabled |
| DMA Continuous Requests | **Enabled *** |
| End Of Conversion Selection | **EOC flag at the end of all conversions *** |
| **ADC_Regular_ConversionMode:** | |
| Number Of Conversion | **5 *** |
| External Trigger Conversion Source | **Timer 3 Trigger Out event *** |
| External Trigger Conversion Edge | Trigger detection on the rising edge |
| Rank | 1 |
| Channel | Channel 0 |
| Sampling Time | **144 Cycles *** |
| Rank | **2 *** |
| Channel | **Channel 1 *** |
| Sampling Time | **28 Cycles *** |
| Rank | **3 *** |
| Channel | **Channel 4 *** |
| Sampling Time | **28 Cycles *** |
| Rank | **4 *** |
| Channel | **Channel 8 *** |
| Sampling Time | **28 Cycles *** |

| | |
|---|---|
| Rank | **5 *** |
| Channel | **Channel 11 *** |
| Sampling Time | **28 Cycles *** |

**ADC_Injected_ConversionMode:**

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

**WatchDog:**

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

## *5.2. I2C1*

**I2C: I2C**

### 5.2.1. 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 | 0x00 |
| General Call address detection | Disabled |

## *5.3. SYS*

**Timebase Source: SysTick**

## *5.4. TIM3*

**Channel2: PWM Generation CH2**

### 5.4.1. Parameter Settings:

**Counter Settings:**

| | |
|---|---|
| Prescaler (PSC - 16 bits value) | 0 |
| Counter Mode | Up |

| | |
|---|---|
| Counter Period (AutoReload Register - 16 bits value ) | **4999 *** |
| Internal Clock Division (CKD) | No Division |

**Trigger Output (TRGO) Parameters:**

| | |
|---|---|
| Master/Slave Mode | Disable (no sync between this TIM (Master) and its Slaves |
| Trigger Event Selection | **Update Event *** |

**PWM Generation Channel 2:**

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

## *5.5. USART2*

**Mode: Asynchronous**

### 5.5.1. 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 |

## *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 | **30 *** |
| 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 |

**Memory management settings:**

| | |
|---|---|
| Memory Allocation | Dynamic |
| TOTAL_HEAP_SIZE | 15360 |
| Memory Management scheme | **heap_1 *** |

**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 |

### 5.6.2. Include parameters:

**Include definitions:**

| | |
|---|---|
| vTaskPrioritySet | Enabled |
| uxTaskPriorityGet | Enabled |
| vTaskDelete | Enabled |
| vTaskCleanUpResources | Disabled |
| vTaskSuspend | Enabled |
| vTaskDelayUntil | **Enabled *** |
| 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 |

*** User modified value**

# 6. System Configuration

## 6.1. GPIO configuration

| IP | Pin | Signal | GPIO mode | GPIO pull/up pull down | Max Speed | User Label |
|---|---|---|---|---|---|---|
| ADC1 | PC1 | ADC1_IN11 | Analog mode | No pull-up and no pull-down | n/a | Param4 |
| | PA0-WKUP | ADC1_IN0 | Analog mode | No pull-up and no pull-down | n/a | Current |
| | PA1 | ADC1_IN1 | Analog mode | No pull-up and no pull-down | n/a | Param1 |
| | PA4 | ADC1_IN4 | Analog mode | No pull-up and no pull-down | n/a | Param2 |
| | PB0 | ADC1_IN8 | Analog mode | No pull-up and no pull-down | n/a | Param3 |
| I2C1 | PB8 | I2C1_SCL | Alternate Function Open Drain | **No pull-up and no pull-down *** | **Very High *** | I2C_SCL |
| | PB9 | I2C1_SDA | Alternate Function Open Drain | **No pull-up and no pull-down *** | **Very High *** | I2C_SDA |
| TIM3 | PC7 | TIM3_CH2 | Alternate Function Push Pull | No pull-up and no pull-down | **Very High *** | PWM |
| USART2 | PA2 | USART2_TX | Alternate Function Push Pull | Pull-up | **Very High *** | USART_TX |
| | PA3 | USART2_RX | Alternate Function Push Pull | Pull-up | **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 |
| 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] |
| | PA5 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | LD2 [Green Led] |
| | PB10 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | **Very High *** | EncErr |

| IP | Pin | Signal | GPIO mode | GPIO pull/up pull down | Max Speed | User Label |
|---|---|---|---|---|---|---|
| | PA8 | GPIO_Output | Output Push Pull | **Pull-down *** | **Very High *** | AIN1 |
| | PA9 | GPIO_Output | Output Push Pull | **Pull-down *** | **Very High *** | AIN2 |
| | PB4 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | **Very High *** | SysLED |
| | PB5 | GPIO_Input | Input mode | No pull-up and no pull-down | **n/a** | SVON |
| | PB6 | GPIO_Input | Input mode | **Pull-up *** | **n/a** | SysPush |

## 6.2. DMA configuration

| DMA request | Stream | Direction | Priority |
|---|---|---|---|
| ADC1 | DMA2_Stream0 | Peripheral To Memory | **Very High *** |
| I2C1_RX | DMA1_Stream0 | Peripheral To Memory | **Very High *** |

### *ADC1: DMA2_Stream0 DMA request Settings:*

| | |
|---|---|
| Mode: | **Circular *** |
| Use fifo: | Disable |
| Peripheral Increment: | Disable |
| Memory Increment: | **Enable *** |
| Peripheral Data Width: | Half Word |
| Memory Data Width: | Half Word |

### *I2C1_RX: DMA1_Stream0 DMA request Settings:*

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

## 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 |
| DMA1 stream0 global interrupt | true | 5 | 0 |
| ADC1 global interrupt | true | 5 | 0 |
| I2C1 event interrupt | true | 5 | 0 |
| I2C1 error interrupt | true | 5 | 0 |
| DMA2 stream0 global interrupt | true | 5 | 0 |
| PVD interrupt through EXTI line 16 | unused | | |
| Flash global interrupt | unused | | |
| RCC global interrupt | unused | | |
| TIM3 global interrupt | unused | | |
| USART2 global interrupt | unused | | |
| EXTI line[15:10] interrupts | unused | | |
| FPU global interrupt | unused | | |

*** User modified value**

# 7. Power Consumption Calculator report

7.1. Microcontroller Selection

| | |
|---|---|
| Series | STM32F4 |
| Line | STM32F411 |
| MCU | STM32F411RETx |
| Datasheet | 026289_Rev4 |

7.2. Parameter Selection

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

# 8. Software Project

## 8.1. Project Settings

| Name | Value |
|---|---|
| Project Name | DCMotorControlShieldV1_0 |
| Project Folder | C:\SW4STM32\DCMotorControlShield\V1_0\Rev_1_0\Nucleo- |
| 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 |