



## 1. Description

### 1.1. Project

Project Name	MMR_Control_Board_V2
Board Name	custom
Generated with:	STM32CubeMX 6.12.0
Date	09/23/2024

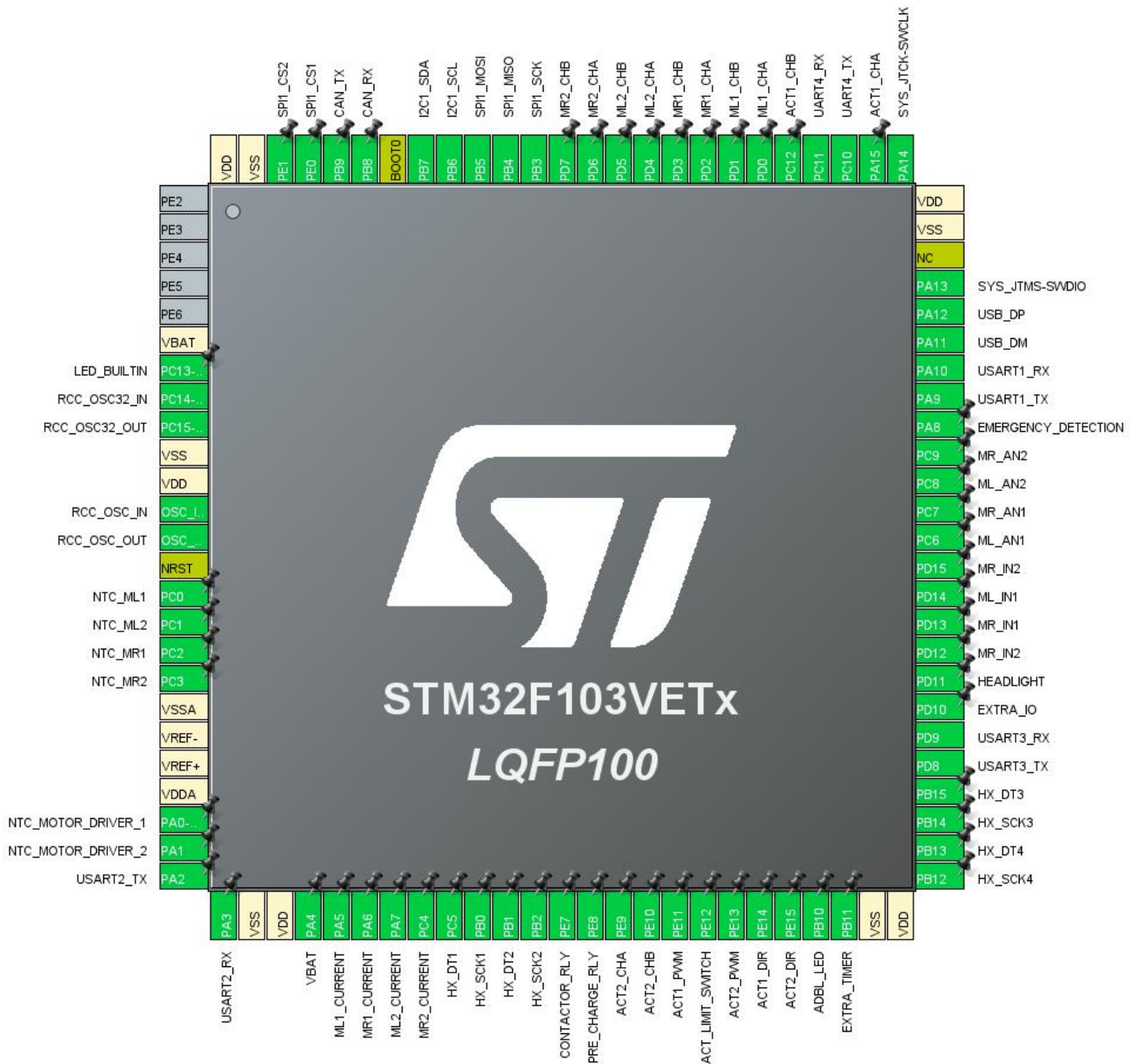
### 1.2. MCU

MCU Series	STM32F1
MCU Line	STM32F103
MCU name	STM32F103VETx
MCU Package	LQFP100
MCU Pin number	100

### 1.3. Core(s) information

Core(s)	Arm Cortex-M3
---------	---------------

## 2. Pinout Configuration



### 3. Pins Configuration

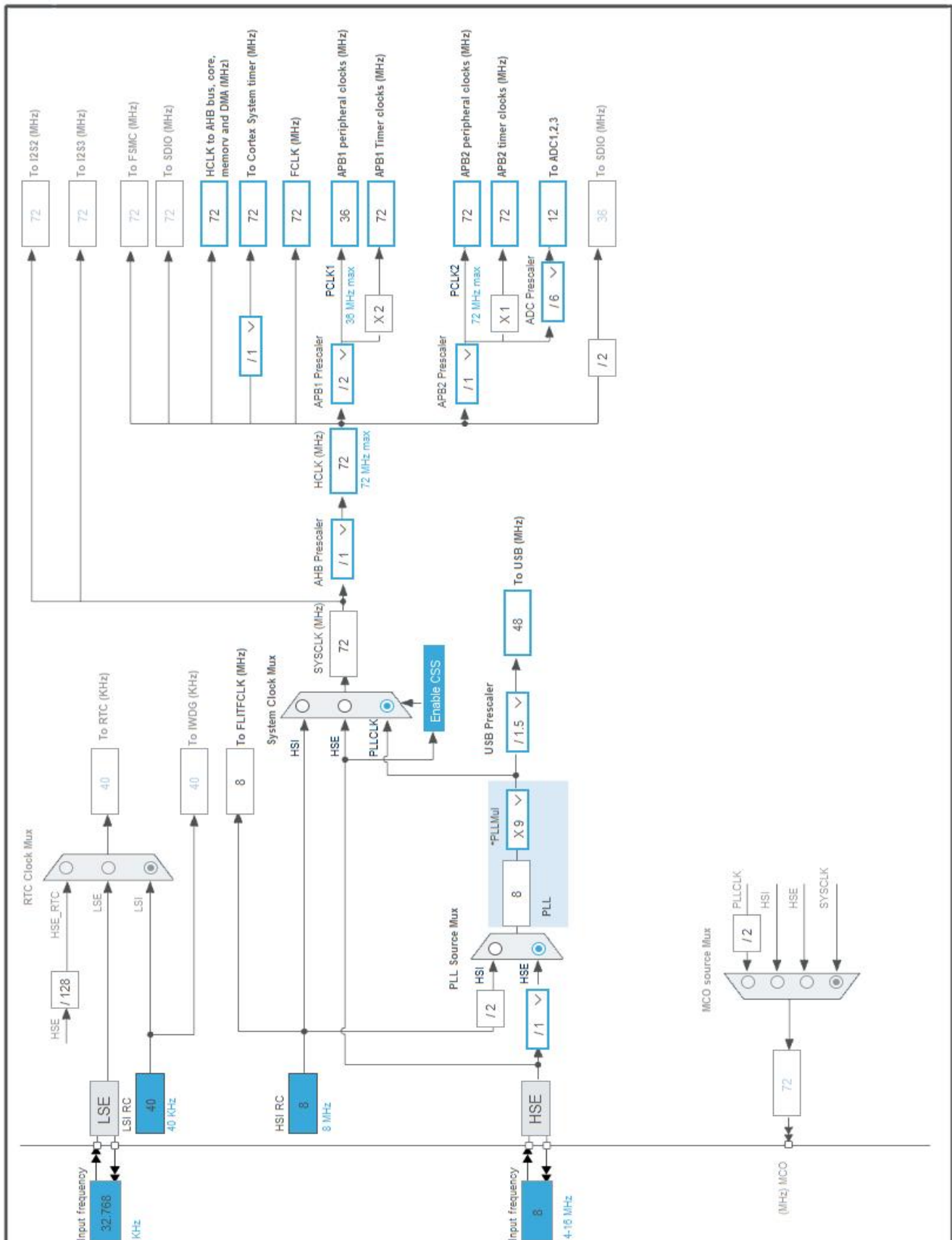
Pin Number LQFP100	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
6	VBAT	Power		
7	PC13-TAMPER-RTC *	I/O	GPIO_Output	LED_BUILTIN
8	PC14-OSC32_IN	I/O	RCC_OSC32_IN	
9	PC15-OSC32_OUT	I/O	RCC_OSC32_OUT	
10	VSS	Power		
11	VDD	Power		
12	OSC_IN	MonolO	RCC_OSC_IN	
13	OSC_OUT	MonolO	RCC_OSC_OUT	
14	NRST	Reset		
15	PC0	I/O	ADC1_IN10	NTC_ML1
16	PC1	I/O	ADC1_IN11	NTC_ML2
17	PC2	I/O	ADC1_IN12	NTC_MR1
18	PC3	I/O	ADC1_IN13	NTC_MR2
19	VSSA	Power		
20	VREF-	Power		
21	VREF+	Power		
22	VDDA	Power		
23	PA0-WKUP	I/O	ADC1_IN0	NTC_MOTOR_DRIVER_1
24	PA1	I/O	ADC1_IN1	NTC_MOTOR_DRIVER_2
25	PA2	I/O	USART2_TX	
26	PA3	I/O	USART2_RX	
27	VSS	Power		
28	VDD	Power		
29	PA4	I/O	ADC1_IN4	VBAT
30	PA5	I/O	ADC2_IN5	ML1_CURRENT
31	PA6	I/O	ADC2_IN6	MR1_CURRENT
32	PA7	I/O	ADC2_IN7	ML2_CURRENT
33	PC4	I/O	ADC2_IN14	MR2_CURRENT
34	PC5 *	I/O	GPIO_Output	HX_DT1
35	PB0 *	I/O	GPIO_Output	HX_SCK1
36	PB1 *	I/O	GPIO_Output	HX_DT2
37	PB2 *	I/O	GPIO_Output	HX_SCK2
38	PE7 *	I/O	GPIO_Output	CONTACTOR_RLY
39	PE8 *	I/O	GPIO_Output	PRE_CHARGE_RLY
40	PE9	I/O	GPIO_EXTI9	ACT2_CHA
41	PE10	I/O	GPIO_EXTI10	ACT2_CHB

Pin Number LQFP100	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
42	PE11	I/O	TIM1_CH2	ACT1_PWM
43	PE12 *	I/O	GPIO_Input	ACT_LIMIT_SWITCH
44	PE13	I/O	TIM1_CH3	ACT2_PWM
45	PE14 *	I/O	GPIO_Output	ACT1_DIR
46	PE15 *	I/O	GPIO_Output	ACT2_DIR
47	PB10	I/O	TIM2_CH3	ADBL_LED
48	PB11	I/O	TIM2_CH4	EXTRA_TIMER
49	VSS	Power		
50	VDD	Power		
51	PB12 *	I/O	GPIO_Output	HX_SCK4
52	PB13 *	I/O	GPIO_Output	HX_DT4
53	PB14 *	I/O	GPIO_Output	HX_SCK3
54	PB15 *	I/O	GPIO_Output	HX_DT3
55	PD8	I/O	USART3_TX	
56	PD9	I/O	USART3_RX	
57	PD10 *	I/O	GPIO_Output	EXTRA_IO
58	PD11 *	I/O	GPIO_Output	HEADLIGHT
59	PD12 *	I/O	GPIO_Output	MR_IN2
60	PD13 *	I/O	GPIO_Output	MR_IN1
61	PD14 *	I/O	GPIO_Output	ML_IN1
62	PD15 *	I/O	GPIO_Output	MR_IN2
63	PC6	I/O	TIM3_CH1	ML_AN1
64	PC7	I/O	TIM3_CH2	MR_AN1
65	PC8	I/O	TIM3_CH3	ML_AN2
66	PC9	I/O	TIM3_CH4	MR_AN2
67	PA8	I/O	GPIO_EXTI8	EMERGENCY_DETECTION
68	PA9	I/O	USART1_TX	
69	PA10	I/O	USART1_RX	
70	PA11	I/O	USB_DM	
71	PA12	I/O	USB_DP	
72	PA13	I/O	SYS_JTMS-SWDIO	
73	NC	NC		
74	VSS	Power		
75	VDD	Power		
76	PA14	I/O	SYS_JTCK-SWCLK	
77	PA15	I/O	GPIO_EXTI15	ACT1_CHA
78	PC10	I/O	UART4_TX	
79	PC11	I/O	UART4_RX	
80	PC12	I/O	GPIO_EXTI12	ACT1_CHB

Pin Number LQFP100	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
81	PD0	I/O	GPIO_EXTI0	ML1_CHA
82	PD1	I/O	GPIO_EXTI1	ML1_CHB
83	PD2	I/O	GPIO_EXTI2	MR1_CHA
84	PD3	I/O	GPIO_EXTI3	MR1_CHB
85	PD4	I/O	GPIO_EXTI4	ML2_CHA
86	PD5	I/O	GPIO_EXTI5	ML2_CHB
87	PD6	I/O	GPIO_EXTI6	MR2_CHA
88	PD7	I/O	GPIO_EXTI7	MR2_CHB
89	PB3	I/O	SPI1_SCK	
90	PB4	I/O	SPI1_MISO	
91	PB5	I/O	SPI1_MOSI	
92	PB6	I/O	I2C1_SCL	
93	PB7	I/O	I2C1_SDA	
94	BOOT0	Boot		
95	PB8	I/O	CAN_RX	
96	PB9	I/O	CAN_TX	
97	PE0 *	I/O	GPIO_Output	SPI1_CS1
98	PE1 *	I/O	GPIO_Output	SPI1_CS2
99	VSS	Power		
100	VDD	Power		

\* The pin is affected with an I/O function

## 4. Clock Tree Configuration



## 1. Power Consumption Calculator report

### 1.1. Microcontroller Selection

Series	STM32F1
Line	STM32F103
MCU	STM32F103VETx
Datasheet	DS5792_Rev12

### 1.2. Parameter Selection

Temperature	25
Vdd	3.3

### 1.3. 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



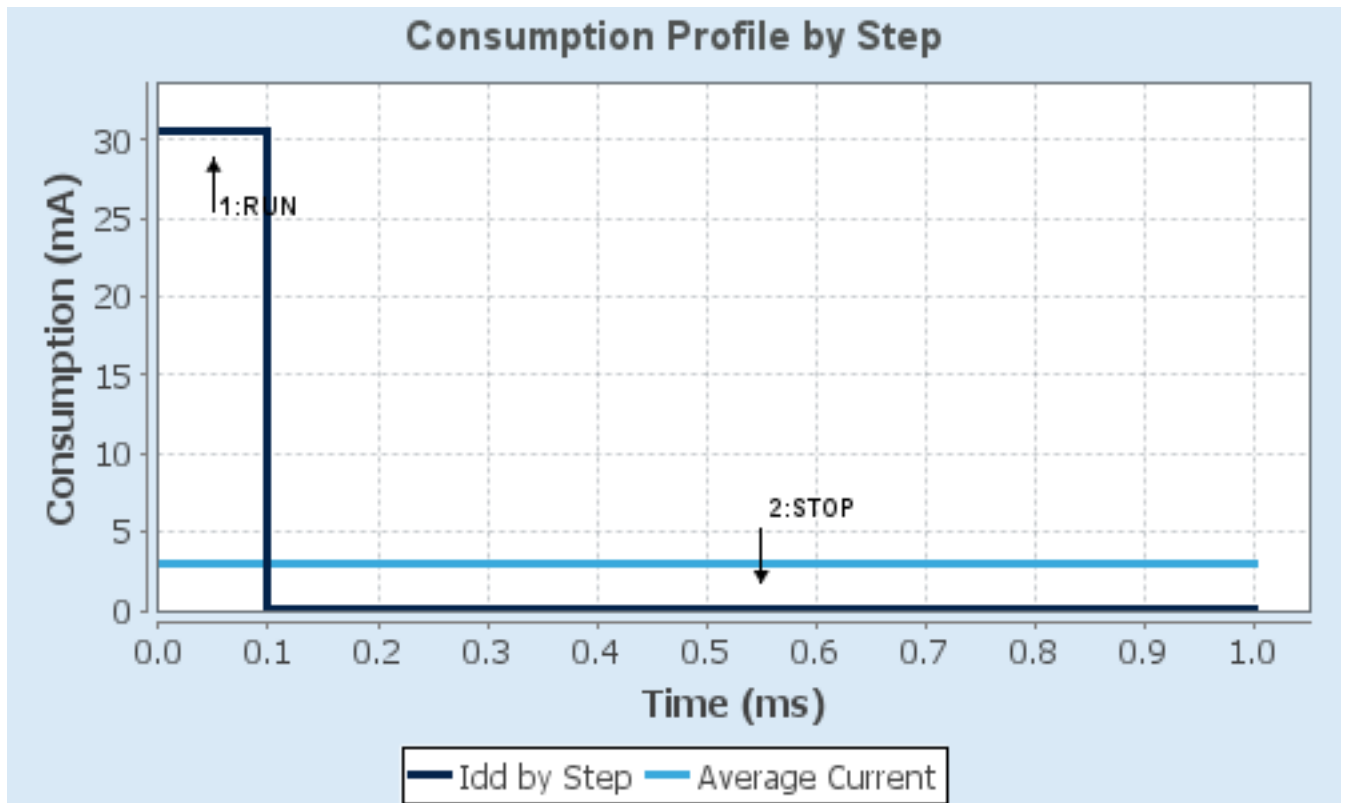
#### 1.4. Sequence

<b>Step</b>	Step1	Step2
<b>Mode</b>	RUN	STOP
<b>Vdd</b>	3.3	3.3
<b>Voltage Source</b>	Battery	Battery
<b>Range</b>	No Scale	No Scale
<b>Fetch Type</b>	FLASH	n/a
<b>CPU Frequency</b>	72 MHz	0 Hz
<b>Clock Configuration</b>	HSE PLL	Regulator LP
<b>Clock Source Frequency</b>	8 MHz	0 Hz
<b>Peripherals</b>		
<b>Additional Cons.</b>	0 mA	0 mA
<b>Average Current</b>	30.5 mA	25 $\mu$ A
<b>Duration</b>	0.1 ms	0.9 ms
<b>DMIPS</b>	90.0	0.0
<b>Ta Max</b>	100.37	105
<b>Category</b>	In DS Table	In DS Table

#### 1.5. Results

Sequence Time	1 ms	Average Current	3.07 mA
Battery Life	1 month, 15 days, 15 hours	Average DMIPS	61.0 DMIPS

#### 1.6. Chart



## 2. Software Project

### 2.1. Project Settings

Name	Value
Project Name	MMR_Control_Board_V2.0
Project Folder	C:\Users\Kunaal\Desktop\Flomobility\MMR_Control_Board_V2.0
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_F1 V1.8.6
Application Structure	Advanced
Generate Under Root	Yes
Do not generate the main()	No
Minimum Heap Size	0x200
Minimum Stack Size	0x400

### 2.2. 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
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

### 2.3. Advanced Settings - Generated Function Calls

Rank	Function Name	Peripheral Instance Name
1	SystemClock_Config	RCC
2	MX_GPIO_Init	GPIO
3	MX_ADC1_Init	ADC1
4	MX_TIM3_Init	TIM3
5	MX_CAN_Init	CAN
6	MX_USB_PCD_Init	USB
7	MX_I2C1_Init	I2C1
8	MX_SPI1_Init	SPI1
9	MX_USART1_UART_Init	USART1
10	MX_USART2_UART_Init	USART2
11	MX_USART3_UART_Init	USART3

Rank	Function Name	Peripheral Instance Name
12	MX_UART4_Init	UART4
13	MX_TIM1_Init	TIM1
14	MX_ADC2_Init	ADC2
15	MX_TIM2_Init	TIM2

### 3. Peripherals and Middlewares Configuration

#### 3.1. ADC1

mode: IN0

mode: IN1

mode: IN4

mode: IN10

mode: IN11

mode: IN12

mode: IN13

##### 3.1.1. Parameter Settings:

###### **ADCs\_Common\_Settings:**

Mode Independent mode

###### **ADC\_Settings:**

Data Alignment Right alignment

Scan Conversion Mode Disabled

Continuous Conversion Mode Disabled

Discontinuous Conversion Mode Disabled

###### **ADC\_Regular\_ConversionMode:**

Enable Regular Conversions Enable

Number Of Conversion 1

External Trigger Conversion Source Regular Conversion launched by software

Rank 1

Channel Channel 0

Sampling Time 1.5 Cycles

###### **ADC\_Injected\_ConversionMode:**

Enable Injected Conversions Disable

###### **WatchDog:**

Enable Analog WatchDog Mode false

#### 3.2. ADC2

mode: IN5

mode: IN6

mode: IN7

mode: IN14

### 3.2.1. Parameter Settings:

#### **ADCs\_Common\_Settings:**

Mode Independent mode

#### **ADC\_Settings:**

Data Alignment Right alignment

Scan Conversion Mode Disabled

Continuous Conversion Mode Disabled

Discontinuous Conversion Mode Disabled

#### **ADC\_Regular\_ConversionMode:**

Enable Regular Conversions Enable

Number Of Conversion 1

External Trigger Conversion Source Regular Conversion launched by software

Rank 1

Channel Channel 5

Sampling Time 1.5 Cycles

#### **ADC\_Injected\_ConversionMode:**

Enable Injected Conversions Disable

#### **WatchDog:**

Enable Analog WatchDog Mode false

## **3.3. CAN**

### **mode: Activated**

### 3.3.1. Parameter Settings:

#### **Bit Timings Parameters:**

Prescaler (for Time Quantum) 16

Time Quantum **444.44444444444446 \***

Time Quanta in Bit Segment 1 1 Time

Time Quanta in Bit Segment 2 1 Time

Time for one Bit **1333 \***

Baud Rate **749999 \***

ReSynchronization Jump Width 1 Time

#### **Basic Parameters:**

Time Triggered Communication Mode Disable

Automatic Bus-Off Management Disable

Automatic Wake-Up Mode Disable

Automatic Retransmission Disable

Receive Fifo Locked Mode	Disable
Transmit Fifo Priority	Disable

**Advanced Parameters:**

Test Mode	Normal
-----------	--------

### 3.4. I2C1

#### I2C: I2C

##### 3.4.1. 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

### 3.5. RCC

**High Speed Clock (HSE): Crystal/Ceramic Resonator**

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

##### 3.5.1. Parameter Settings:

**System Parameters:**

VDD voltage (V)	3.3
Prefetch Buffer	Enabled
Flash Latency(WS)	2 WS (3 CPU cycle)

**RCC Parameters:**

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

### 3.6. SPI1

## Mode: Full-Duplex Master

### 3.6.1. Parameter Settings:

#### Basic Parameters:

Frame Format	Motorola
Data Size	8 Bits
First Bit	MSB First

#### Clock Parameters:

Prescaler (for Baud Rate)	<b>4 *</b>
Baud Rate	<b>18.0 MBits/s *</b>
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

#### Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

## 3.7. SYS

### Debug: Serial Wire

Timebase Source: SysTick

## 3.8. TIM1

**Clock Source : Internal Clock**

**Channel2: PWM Generation CH2**

**Channel3: PWM Generation CH3**

### 3.8.1. Parameter Settings:

#### Counter Settings:

Prescaler (PSC - 16 bits value)	<b>72 - 1 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value )	<b>255 - 1 *</b>
Internal Clock Division (CKD)	No Division
Repetition Counter (RCR - 8 bits value)	0
auto-reload preload	Disable

#### Trigger Output (TRGO) Parameters:

Master/Slave Mode (MSM bit)	Disable (Trigger input effect not delayed)
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 2:**

Mode	PWM mode 1
Pulse (16 bits value)	0
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High
CH Idle State	Reset

**PWM Generation Channel 3:**

Mode	PWM mode 1
Pulse (16 bits value)	0
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High
CH Idle State	Reset

### 3.9. TIM2

**Channel3: PWM Generation CH3**

**Channel4: PWM Generation CH4**

3.9.1. Parameter Settings:

**Counter Settings:**

Prescaler (PSC - 16 bits value)	<b>72 - 1 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value )	<b>255 - 1 *</b>
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable

**Trigger Output (TRGO) Parameters:**

Master/Slave Mode (MSM bit)	Disable (Trigger input effect not delayed)
Trigger Event Selection	Reset (UG bit from TIMx_EGR)

**PWM Generation Channel 3:**

Mode	PWM mode 1
Pulse (16 bits value)	0

Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High

#### **PWM Generation Channel 4:**

Mode	PWM mode 1
Pulse (16 bits value)	0
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High

### **3.10. TIM3**

**Clock Source : Internal Clock**

**Channel1: PWM Generation CH1**

**Channel2: PWM Generation CH2**

**Channel3: PWM Generation CH3**

**Channel4: PWM Generation CH4**

#### **3.10.1. Parameter Settings:**

##### **Counter Settings:**

Prescaler (PSC - 16 bits value)	<b>72 - 1 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value )	<b>255 - 1 *</b>
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable

##### **Trigger Output (TRGO) Parameters:**

Master/Slave Mode (MSM bit)	Disable (Trigger input effect not delayed)
Trigger Event Selection	Reset (UG bit from TIMx_EGR)

##### **PWM Generation Channel 1:**

Mode	PWM mode 1
Pulse (16 bits value)	0
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High

##### **PWM Generation Channel 2:**

Mode	PWM mode 1
Pulse (16 bits value)	0
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High

#### **PWM Generation Channel 3:**

Mode	PWM mode 1
Pulse (16 bits value)	0
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High

#### **PWM Generation Channel 4:**

Mode	PWM mode 1
Pulse (16 bits value)	0
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High

### **3.11. UART4**

#### **Mode: Asynchronous**

##### 3.11.1. 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

### **3.12. USART1**

#### **Mode: Asynchronous**

##### 3.12.1. 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

### 3.13. USART2

**Mode: Asynchronous**

#### 3.13.1. 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

### 3.14. USART3

**Mode: Asynchronous**

#### 3.14.1. 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

### 3.15. USB

**mode: Device (FS)**

#### 3.15.1. Parameter Settings:

**Basic Parameters:**

Speed	Full Speed 12MBit/s
-------	---------------------

**Power Parameters:**

Low Power	Disabled
Link Power Management	Disabled
Battery Charging	Disabled

**\* User modified value**

## 4. System Configuration

### 4.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
ADC1	PC0	ADC1_IN10	Analog mode	n/a	n/a	NTC_ML1
	PC1	ADC1_IN11	Analog mode	n/a	n/a	NTC_ML2
	PC2	ADC1_IN12	Analog mode	n/a	n/a	NTC_MR1
	PC3	ADC1_IN13	Analog mode	n/a	n/a	NTC_MR2
	PA0-WKUP	ADC1_IN0	Analog mode	n/a	n/a	NTC_MOTOR_DRIVER_1
	PA1	ADC1_IN1	Analog mode	n/a	n/a	NTC_MOTOR_DRIVER_2
	PA4	ADC1_IN4	Analog mode	n/a	n/a	VBAT
ADC2	PA5	ADC2_IN5	Analog mode	n/a	n/a	ML1_CURRENT
	PA6	ADC2_IN6	Analog mode	n/a	n/a	MR1_CURRENT
	PA7	ADC2_IN7	Analog mode	n/a	n/a	ML2_CURRENT
	PC4	ADC2_IN14	Analog mode	n/a	n/a	MR2_CURRENT
CAN	PB8	CAN_RX	Input mode	No pull-up and no pull-down	n/a	
	PB9	CAN_TX	Alternate Function Push Pull	n/a	High *	
I2C1	PB6	I2C1_SCL	Alternate Function Open Drain	n/a	High *	
	PB7	I2C1_SDA	Alternate Function Open Drain	n/a	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	
	OSC_IN	RCC_OSC_IN	n/a	n/a	n/a	
	OSC_OUT	RCC_OSC_OUT	n/a	n/a	n/a	
SPI1	PB3	SPI1_SCK	Alternate Function Push Pull	n/a	High *	
	PB4	SPI1_MISO	Input mode	No pull-up and no pull-down	n/a	
	PB5	SPI1_MOSI	Alternate Function Push Pull	n/a	High *	
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
TIM1	PE11	TIM1_CH2	Alternate Function Push Pull	n/a	Low	ACT1_PWM
	PE13	TIM1_CH3	Alternate Function Push Pull	n/a	Low	ACT2_PWM
TIM2	PB10	TIM2_CH3	Alternate Function Push Pull	n/a	Low	ADBL_LED
	PB11	TIM2_CH4	Alternate Function Push Pull	n/a	Low	EXTRA_TIMER
TIM3	PC6	TIM3_CH1	Alternate Function Push Pull	n/a	Low	ML_AN1
	PC7	TIM3_CH2	Alternate Function Push Pull	n/a	Low	MR_AN1

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PC8	TIM3_CH3	Alternate Function Push Pull	n/a	Low	ML_AN2
	PC9	TIM3_CH4	Alternate Function Push Pull	n/a	Low	MR_AN2
UART4	PC10	UART4_TX	Alternate Function Push Pull	n/a	High *	
	PC11	UART4_RX	Input mode	No pull-up and no pull-down	n/a	
USART1	PA9	USART1_TX	Alternate Function Push Pull	n/a	High *	
	PA10	USART1_RX	Input mode	No pull-up and no pull-down	n/a	
USART2	PA2	USART2_TX	Alternate Function Push Pull	n/a	High *	
	PA3	USART2_RX	Input mode	No pull-up and no pull-down	n/a	
USART3	PD8	USART3_TX	Alternate Function Push Pull	n/a	High *	
	PD9	USART3_RX	Input mode	No pull-up and no pull-down	n/a	
USB	PA11	USB_DM	n/a	n/a	n/a	
	PA12	USB_DP	n/a	n/a	n/a	
GPIO	PC13-TAMPER-RTC	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_BUILTIN
	PC5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	HX_DT1
	PB0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	HX_SCK1
	PB1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	HX_DT2
	PB2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	HX_SCK2
	PE7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	CONTACTOR_RLY
	PE8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PRE_CHARGE_RLY
	PE9	GPIO_EXTI9	<b>External Interrupt Mode with Rising/Falling edge</b>	No pull-up and no pull-down	n/a	ACT2_CHA
	PE10	GPIO_EXTI10	<b>External Interrupt Mode with Rising/Falling edge</b>	No pull-up and no pull-down	n/a	ACT2_CHB
	PE12	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	ACT_LIMIT_SWITCH
	PE14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ACT1_DIR
	PE15	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ACT2_DIR
	PB12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	HX_SCK4
	PB13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	HX_DT4
	PB14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	HX_SCK3
	PB15	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	HX_DT3
	PD10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	EXTRA_IO
	PD11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	HEADLIGHT
	PD12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	MR_IN2
	PD13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	MR_IN1
	PD14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ML_IN1

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PD15	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	MR_IN2
	PA8	GPIO_EXTI8	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	EMERGENCY_DETECTION
	PA15	GPIO_EXTI15	<b>External Interrupt Mode with Rising/Falling edge</b>	No pull-up and no pull-down	n/a	ACT1_CHA
	PC12	GPIO_EXTI12	<b>External Interrupt Mode with Rising/Falling edge</b>	No pull-up and no pull-down	n/a	ACT1_CHB
	PD0	GPIO_EXTI0	<b>External Interrupt Mode with Rising/Falling edge</b>	No pull-up and no pull-down	n/a	ML1_CHA
	PD1	GPIO_EXTI1	<b>External Interrupt Mode with Rising/Falling edge</b>	No pull-up and no pull-down	n/a	ML1_CHB
	PD2	GPIO_EXTI2	<b>External Interrupt Mode with Rising/Falling edge</b>	No pull-up and no pull-down	n/a	MR1_CHA
	PD3	GPIO_EXTI3	<b>External Interrupt Mode with Rising/Falling edge</b>	No pull-up and no pull-down	n/a	MR1_CHB
	PD4	GPIO_EXTI4	<b>External Interrupt Mode with Rising/Falling edge</b>	No pull-up and no pull-down	n/a	ML2_CHA
	PD5	GPIO_EXTI5	<b>External Interrupt Mode with Rising/Falling edge</b>	No pull-up and no pull-down	n/a	ML2_CHB
	PD6	GPIO_EXTI6	<b>External Interrupt Mode with Rising/Falling edge</b>	No pull-up and no pull-down	n/a	MR2_CHA
	PD7	GPIO_EXTI7	<b>External Interrupt Mode with Rising/Falling edge</b>	No pull-up and no pull-down	n/a	MR2_CHB
	PE0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	SPI1_CS1
	PE1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	SPI1_CS2

## 4.2. DMA configuration



nothing configured in DMA service

### 4.3. NVIC configuration

#### 4.3.1. 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
Prefetch 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	15	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
EXTI line0 interrupt	unused		
EXTI line1 interrupt	unused		
EXTI line2 interrupt	unused		
EXTI line3 interrupt	unused		
EXTI line4 interrupt	unused		
ADC1 and ADC2 global interrupts	unused		
USB high priority or CAN TX interrupts	unused		
USB low priority or CAN RX0 interrupts	unused		
CAN RX1 interrupt	unused		
CAN SCE interrupt	unused		
EXTI line[9:5] interrupts	unused		
TIM1 break interrupt	unused		
TIM1 update interrupt	unused		
TIM1 trigger and commutation interrupts	unused		
TIM1 capture compare interrupt	unused		
TIM2 global interrupt	unused		
TIM3 global interrupt	unused		
I2C1 event interrupt	unused		
I2C1 error interrupt	unused		
SPI1 global interrupt	unused		
USART1 global interrupt	unused		
USART2 global interrupt	unused		
USART3 global interrupt	unused		
EXTI line[15:10] interrupts	unused		
UART4 global interrupt	unused		

#### 4.3.2. NVIC Code generation

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

\* User modified value

## 5. System Views

### 5.1. Category view

#### 5.1.1. Current

Middleware					
System Core	Analog	Timers	Connectivity	Multimedia	Computing
DMA	ADC1 ✓	TIM1 ✓	CAN ✓		
GPIO ✓	ADC2 ✓	TIM2 ✓	I2C1 ✓		
NVIC ✓		TIM3 ✓	SPI1 ✓		
RCC ✓			UART4 ✓		
SYS ✓			USART1 ✓		
			USART2 ✓		
			USART3 ✓		
			USB ✓		

## 6. Docs & Resources

Type	Link
------	------