



## 1. Description

### 1.1. Project

Project Name	ROBOT
Board Name	custom
Generated with:	STM32CubeMX 6.10.0
Date	03/12/2024

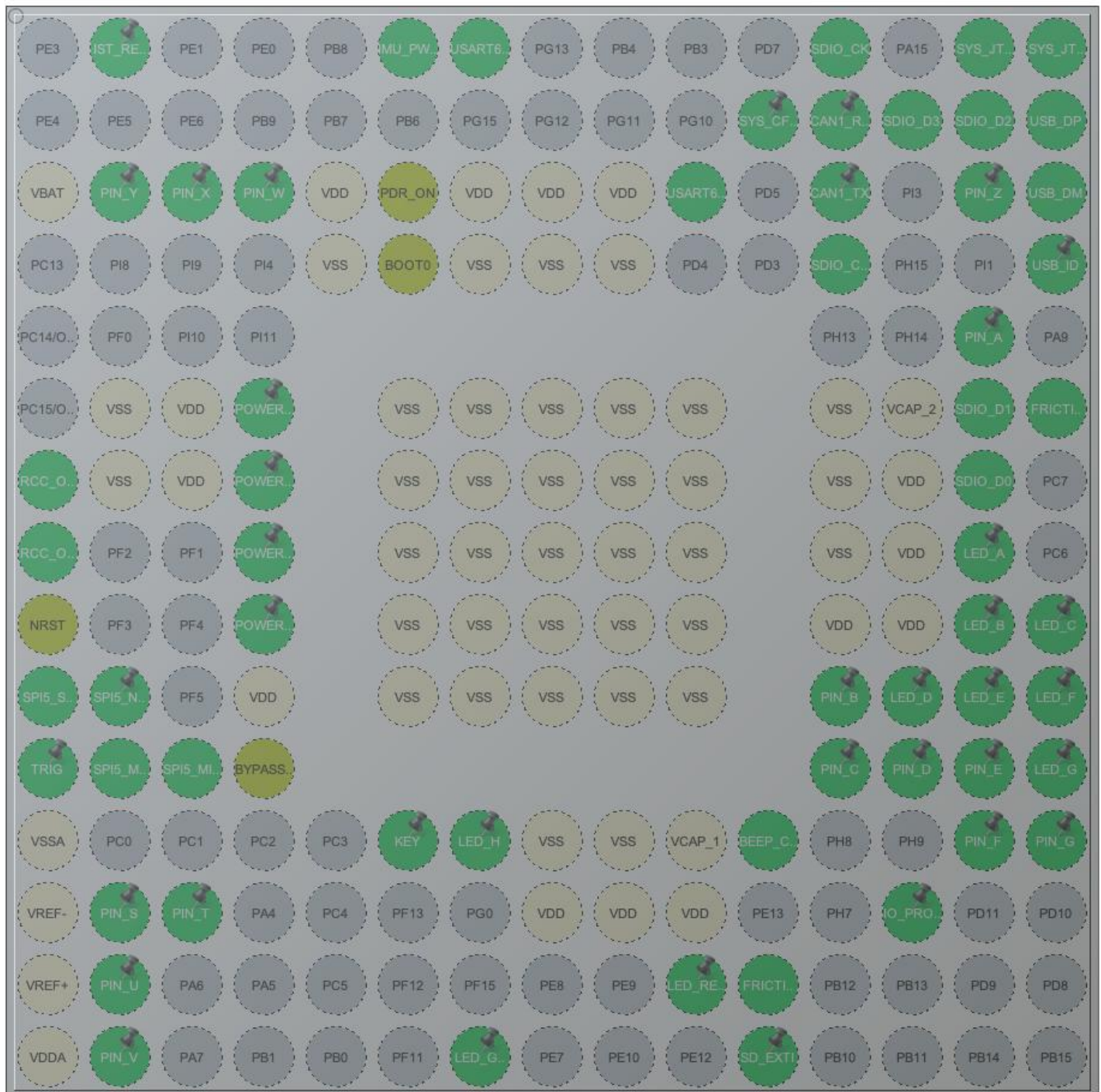
### 1.2. MCU

MCU Series	STM32F4
MCU Line	STM32F427/437
MCU name	STM32F427IIHx
MCU Package	UFBGA176
MCU Pin number	201

### 1.3. Core(s) information

Core(s)	Arm Cortex-M4
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## 2. Pinout Configuration



UFBGA176 +25 (Top view)

### 3. Pins Configuration

Pin Number UFBGA176	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
A2	PE2 *	I/O	GPIO_Output	IST_RESET
A6	PB5	I/O	TIM3_CH2	IMU_PWM_PULSE
A7	PG14	I/O	USART6_TX	
A12	PC12	I/O	SDIO_CK	
A14	PA14	I/O	SYS_JTCK-SWCLK	
A15	PA13	I/O	SYS_JTMS-SWDIO	
B11	PD6 *	I/O	GPIO_Input	SYS_CFG
B12	PD0	I/O	CAN1_RX	
B13	PC11	I/O	SDIO_D3	
B14	PC10	I/O	SDIO_D2	
B15	PA12	I/O	USB_OTG_FS_DP	USB_DP
C1	VBAT	Power		
C2	PI7 *	I/O	GPIO_Analog	PIN_Y
C3	PI6 *	I/O	GPIO_Analog	PIN_X
C4	PI5 *	I/O	GPIO_Analog	PIN_W
C5	VDD	Power		
C6	PDR_ON	Reset		
C7	VDD	Power		
C8	VDD	Power		
C9	VDD	Power		
C10	PG9	I/O	USART6_RX	
C12	PD1	I/O	CAN1_TX	
C14	PI2 *	I/O	GPIO_Analog	PIN_Z
C15	PA11	I/O	USB_OTG_FS_DM	USB_DM
D5	VSS	Power		
D6	BOOT0	Boot		
D7	VSS	Power		
D8	VSS	Power		
D9	VSS	Power		
D12	PD2	I/O	SDIO_CMD	
D15	PA10	I/O	USB_OTG_FS_ID	USB_ID
E14	PI0 *	I/O	GPIO_Analog	PIN_A
F2	VSS	Power		
F3	VDD	Power		
F4	PH2 *	I/O	GPIO_Output	POWER1_CTRL
F6	VSS	Power		

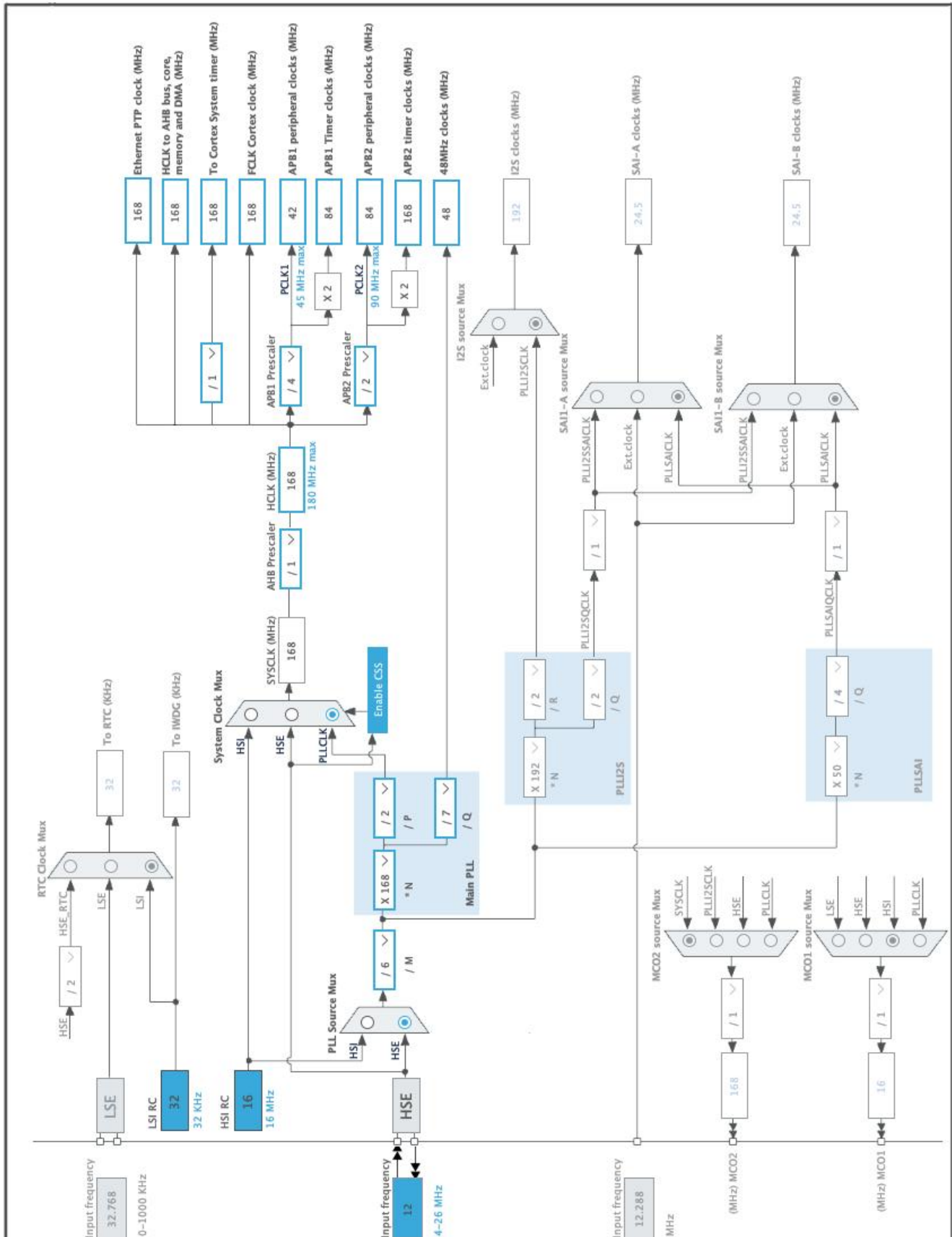
Pin Number UFBGA176	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
F7	VSS	Power		
F8	VSS	Power		
F9	VSS	Power		
F10	VSS	Power		
F12	VSS	Power		
F13	VCAP_2	Power		
F14	PC9	I/O	SDIO_D1	
F15	PA8	I/O	TIM1_CH1	FRICTION_L
G1	PH0/OSC_IN	I/O	RCC_OSC_IN	
G2	VSS	Power		
G3	VDD	Power		
G4	PH3 *	I/O	GPIO_Output	POWER2_CTRL
G6	VSS	Power		
G7	VSS	Power		
G8	VSS	Power		
G9	VSS	Power		
G10	VSS	Power		
G12	VSS	Power		
G13	VDD	Power		
G14	PC8	I/O	SDIO_D0	
H1	PH1/OSC_OUT	I/O	RCC_OSC_OUT	
H4	PH4 *	I/O	GPIO_Output	POWER3_CTRL
H6	VSS	Power		
H7	VSS	Power		
H8	VSS	Power		
H9	VSS	Power		
H10	VSS	Power		
H12	VSS	Power		
H13	VDD	Power		
H14	PG8 *	I/O	GPIO_Output	LED_A
J1	NRST	Reset		
J4	PH5 *	I/O	GPIO_Output	POWER4_CTRL
J6	VSS	Power		
J7	VSS	Power		
J8	VSS	Power		
J9	VSS	Power		
J10	VSS	Power		
J12	VDD	Power		
J13	VDD	Power		

Pin Number UFBGA176	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
J14	PG7 *	I/O	GPIO_Output	LED_B
J15	PG6 *	I/O	GPIO_Output	LED_C
K1	PF7	I/O	SPI5_SCK	
K2	PF6 *	I/O	GPIO_Output	SPI5_NSS
K4	VDD	Power		
K6	VSS	Power		
K7	VSS	Power		
K8	VSS	Power		
K9	VSS	Power		
K10	VSS	Power		
K12	PH12 *	I/O	GPIO_Analog	PIN_B
K13	PG5 *	I/O	GPIO_Output	LED_D
K14	PG4 *	I/O	GPIO_Output	LED_E
K15	PG3 *	I/O	GPIO_Output	LED_F
L1	PF10	I/O	GPIO_EXTI10	TRIG
L2	PF9	I/O	SPI5_MOSI	
L3	PF8	I/O	SPI5_MISO	
L4	BYPASS_REG	Reset		
L12	PH11 *	I/O	GPIO_Analog	PIN_C
L13	PH10 *	I/O	GPIO_Analog	PIN_D
L14	PD15 *	I/O	GPIO_Analog	PIN_E
L15	PG2 *	I/O	GPIO_Output	LED_G
M1	VSSA	Power		
M6	PB2/BOOT1 *	I/O	GPIO_Input	KEY
M7	PG1 *	I/O	GPIO_Output	LED_H
M8	VSS	Power		
M9	VSS	Power		
M10	VCAP_1	Power		
M11	PH6	I/O	TIM12_CH1	BEEP_CTRL
M14	PD14 *	I/O	GPIO_Analog	PIN_F
M15	PD13 *	I/O	GPIO_Analog	PIN_G
N1	VREF-	Power		
N2	PA1 *	I/O	GPIO_Analog	PIN_S
N3	PA0/WKUP *	I/O	GPIO_Analog	PIN_T
N8	VDD	Power		
N9	VDD	Power		
N10	VDD	Power		
N13	PD12 *	I/O	GPIO_Output	IO_PROBE
P1	VREF+	Power		

Pin Number UFBGA176	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
P2	PA2 *	I/O	GPIO_Analog	PIN_U
P10	PE11 *	I/O	GPIO_Output	LED_RED
P11	PE14	I/O	TIM1_CH4	FRICTION_R
R1	VDDA	Power		
R2	PA3 *	I/O	GPIO_Analog	PIN_V
R7	PF14 *	I/O	GPIO_Output	LED_GREEN
R11	PE15 *	I/O	GPIO_Input	SD_EXTI

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

## 4. Clock Tree Configuration





## 5. Software Project

### 5.1. Project Settings

Name	Value
Project Name	ROBOT
Project Folder	/Users/bentjh01/Documents/01_NTU/FYP/project/RoboMasterDevBoard/stm32_
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_F4 V1.28.0
Application Structure	Advanced
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	Yes
Backup previously generated files when re-generating	No
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)	Yes
Enable Full Assert	No

### 5.3. Advanced Settings - Generated Function Calls

Rank	Function Name	Peripheral Instance Name
1	SystemClock_Config	RCC
2	MX_GPIO_Init	GPIO
3	MX_DMA_Init	DMA
4	MX_SPI5_Init	SPI5
5	MX_CAN1_Init	CAN1
6	MX_USART6_UART_Init	USART6
7	MX_TIM1_Init	TIM1
8	MX_TIM2_Init	TIM2
9	MX_TIM3_Init	TIM3
10	MX_TIM12_Init	TIM12
11	MX_SDIO_SD_Init	SDIO

Rank	Function Name	Peripheral Instance Name
12	MX_USB_OTG_FS_USB_Init	USB_OTG_FS
13	MX_FATFS_Init	FATFS

## 1. Power Consumption Calculator report

### 1.1. Microcontroller Selection

Series	STM32F4
Line	STM32F427/437
MCU	STM32F427IIHx
Datasheet	DS9405_Rev9

### 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

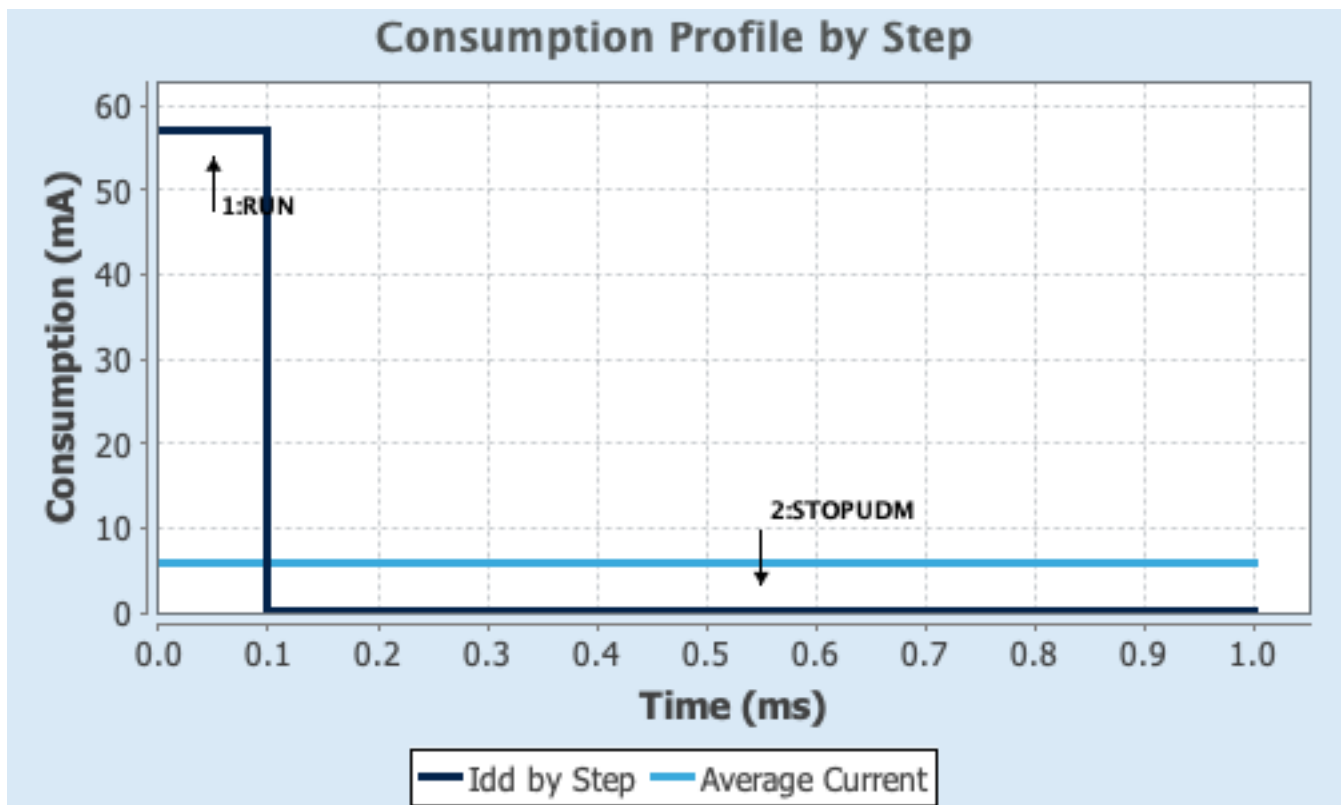
#### 1.4. Sequence

<b>Step</b>	Step1	Step2
<b>Mode</b>	RUN	STOP UDM (Under Drive)
<b>Vdd</b>	3.3	3.3
<b>Voltage Source</b>	Battery	Battery
<b>Range</b>	Scale1-High	No Scale
<b>Fetch Type</b>	FLASH	n/a
<b>CPU Frequency</b>	180 MHz	0 Hz
<b>Clock Configuration</b>	HSE PLL	Regulator LP Flash-PwrDwn
<b>Clock Source Frequency</b>	4 MHz	0 Hz
<b>Peripherals</b>		
<b>Additional Cons.</b>	0 mA	0 mA
<b>Average Current</b>	57 mA	100 $\mu$ A
<b>Duration</b>	0.1 ms	0.9 ms
<b>DMIPS</b>	225.0	0.0
<b>Ta Max</b>	97.66	104.99
<b>Category</b>	In DS Table	In DS Table

#### 1.5. Results

Sequence Time	1 ms	Average Current	5.79 mA
Battery Life	24 days, 10 hours	Average DMIPS	225.0 DMIPS

#### 1.6. Chart



## 2. Peripherals and Middlewares Configuration

### 2.1. CAN1

**mode: Activated**

#### 2.1.1. Parameter Settings:

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

Prescaler (for Time Quantum)	7 *
Time Quantum	166.66666666666669 *
Time Quanta in Bit Segment 1	2 Times *
Time Quanta in Bit Segment 2	3 Times *
Time for one Bit	1000
Baud Rate	999999 *
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	Enable *

##### **Advanced Parameters:**

Operating Mode	Normal
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### 2.2. RCC

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

#### 2.2.1. Parameter Settings:

##### **System Parameters:**

VDD voltage (V)	3.3
Instruction Cache	Enabled
Prefetch Buffer	Enabled
Data Cache	Enabled
Flash Latency(WS)	5 WS (6 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  
Power Over Drive Disabled

## 2.3. SDIO

### Mode: SD 4 bits Wide bus

#### 2.3.1. Parameter Settings:

**SDIO parameters:**

Clock transition on which the bit capture is made	Rising transition
SDIO Clock divider bypass	Disable
SDIO Clock output enable when the bus is idle	Disable the power save for the clock
SDIO hardware flow control	The hardware control flow is disabled
SDIOCLK clock divide factor	0

## 2.4. SPI5

### Mode: Full-Duplex Master

#### 2.4.1. Parameter Settings:

**Basic Parameters:**

Frame Format	Motorola
Data Size	8 Bits
First Bit	MSB First

**Clock Parameters:**

Prescaler (for Baud Rate)	<b>128 *</b>
Baud Rate	<b>656.25 KBits/s *</b>
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

**Advanced Parameters:**

CRC Calculation	Disabled
NSS Signal Type	Software

## 2.5. SYS

## Debug: Serial Wire

Timebase Source: TIM5

## 2.6. TIM1

Channel1: PWM Generation CH1

Channel4: PWM Generation CH4

### 2.6.1. Parameter Settings:

#### Counter Settings:

Prescaler (PSC - 16 bits value)	16 *
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value )	20000-1 *
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 1:

Mode	PWM mode 1
Pulse (16 bits value)	1000 *
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High
CH Idle State	Reset

#### PWM Generation Channel 4:

Mode	PWM mode 1
Pulse (16 bits value)	1000 *
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High



CH Idle State

Reset

## 2.7. TIM2

**Clock Source : Internal Clock**

### 2.7.1. Parameter Settings:

#### **Counter Settings:**

Prescaler (PSC - 16 bits value)	<b>83 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 32 bits value )	<b>1000-1 *</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)

## 2.8. TIM3

**Channel2: PWM Generation CH2**

### 2.8.1. Parameter Settings:

#### **Counter Settings:**

Prescaler (PSC - 16 bits value)	<b>83 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value )	<b>2000-1 *</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 2:**

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

## 2.9. TIM12

### Channel1: PWM Generation CH1

#### 2.9.1. Parameter Settings:

##### Counter Settings:

Prescaler (PSC - 16 bits value)	<b>83 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value )	<b>20000-1 *</b>
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable

##### PWM Generation Channel 1:

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

## 2.10. USART6

### Mode: Asynchronous

#### 2.10.1. Parameter Settings:

##### Basic Parameters:

Baud Rate	<b>921600 *</b>
Word Length	8 Bits (including Parity)
Parity	None
Stop Bits	1

##### Advanced Parameters:

Data Direction	Receive and Transmit
Over Sampling	16 Samples

## 2.11. USB\_OTG\_FS

### Mode: OTG/Dual\_Role\_Device

## 2.12. FATFS

### mode: SD Card

#### 2.12.1. Set Defines:

##### Version:

FATFS version R0.12c

##### Function Parameters:

FS_READONLY (Read-only mode)	Disabled
FS_MINIMIZE (Minimization level)	Disabled
USE_STRFUNC (String functions)	Enabled with LF -> CRLF conversion
USE_FIND (Find functions)	Disabled
USE_MKFS (Make filesystem function)	Enabled
USE_FASTSEEK (Fast seek function)	Enabled
USE_EXPAND (Use f_expand function)	Disabled
USE_CHMOD (Change attributes function)	Disabled
USE_LABEL (Volume label functions)	Disabled
USE_FORWARD (Forward function)	Disabled

##### Locale and Namespace Parameters:

CODE_PAGE (Code page on target)	Latin 1
USE_LFN (Use Long Filename)	<b>Enabled with dynamic working buffer on the STACK *</b>
MAX_LFN (Max Long Filename)	255
LFN_UNICODE (Enable Unicode)	ANSI/OEM
STRF_ENCODE (Character encoding)	UTF-8
FS_RPATH (Relative Path)	Disabled

##### Physical Drive Parameters:

VOLUMES (Logical drives)	1
MAX_SS (Maximum Sector Size)	512
MIN_SS (Minimum Sector Size)	512
MULTI_PARTITION (Volume partitions feature)	Disabled
USE_TRIM (Erase feature)	Disabled
FS_NOFSINFO (Force full FAT scan)	0

##### System Parameters:

FS_TINY (Tiny mode)	Disabled
FS_EXFAT (Support of exFAT file system)	Disabled
FS_NORTC (Timestamp feature)	Dynamic timestamp
FS_REENTRANT (Re-Entrancy)	Enabled
FS_TIMEOUT (Timeout ticks)	1000
USE_MUTEX	Disabled
SYNC_t (O/S sync object)	osSemaphoreId
FS_LOCK (Number of files opened simultaneously)	2

### 2.12.2. Advanced Settings:

#### **SDIO/SDMMC:**

SDIO instance	SDIO
Use dma template	Enabled
BSP code for SD	Generic

### 2.12.3. Platform Settings:

Detect_SDIO	PE15
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## **2.13. FREERTOS**

### **Interface: CMSIS\_V1**

#### 2.13.1. Config parameters:

#### **API:**

FreeRTOS API	CMSIS v1
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#### **Versions:**

FreeRTOS version	10.3.1
CMSIS-RTOS version	1.02

#### **MPU/FPU:**

ENABLE_MPU	Disabled
ENABLE_FPU	Disabled

#### **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	Enabled
USE_TICKLESS_IDLE	Disabled
USE_TASK_NOTIFICATIONS	Enabled
RECORD_STACK_HIGH_ADDRESS	Disabled

#### Memory management settings:

Memory Allocation	<b>Dynamic *</b>
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	<b>Enabled *</b>
USE_DAEMON_TASK_STARTUP_HOOK	Disabled
CHECK_FOR_STACK_OVERFLOW	<b>Option2 *</b>

#### 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
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#### Interrupt nesting behaviour configuration:

LIBRARY_LOWEST_INTERRUPT_PRIORITY	15
LIBRARY_MAX_SYSCALL_INTERRUPT_PRIORITY	5

#### Added with 10.2.1 support:

MESSAGE_BUFFER_LENGTH_TYPE	size_t
USE_POSIX_ERRNO	Disabled

### 2.13.2. Include parameters:

#### Include definitions:

vTaskPrioritySet	Enabled
uxTaskPriorityGet	Enabled
vTaskDelete	Enabled
vTaskCleanUpResources	Disabled
vTaskSuspend	Enabled
vTaskDelayUntil	<b>Enabled *</b>
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
uxTaskGetStackHighWaterMark2	Disabled

### 2.13.3. Advanced settings:

#### **Newlib settings (see parameter description first):**

USE\_NEWLIB\_REENTRANT                      **Enabled \***

#### **Project settings (see parameter description first):**

Use FW pack heap file                      Enabled

**\* User modified value**

### 3. System Configuration

#### 3.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
CAN1	PD0	CAN1_RX	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	
	PD1	CAN1_TX	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	
RCC	PH0/OSC_IN	RCC_OSC_IN	n/a	n/a	n/a	
	PH1/OSC_OUT	RCC_OSC_OUT	n/a	n/a	n/a	
SDIO	PC12	SDIO_CK	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PC11	SDIO_D3	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PC10	SDIO_D2	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PD2	SDIO_CMD	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PC9	SDIO_D1	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PC8	SDIO_D0	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
SPI5	PF7	SPI5_SCK	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	
	PF9	SPI5_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	
	PF8	SPI5_MISO	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	
SYS	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
TIM1	PA8	TIM1_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	FRICTION_L
	PE14	TIM1_CH4	Alternate Function Push Pull	No pull-up and no pull-down	Low	FRICTION_R
TIM3	PB5	TIM3_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	IMU_PWM_PULSE
TIM12	PH6	TIM12_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	BEEP_CTRL
USART6	PG14	USART6_TX	Alternate Function Push Pull	<b>Pull-up *</b>	<b>Very High</b> *	
	PG9	USART6_RX	Alternate Function Push Pull	<b>Pull-up *</b>	<b>Very High</b> *	
USB_OTG_FS	PA12	USB_OTG_FS_DP	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	USB_DP
	PA11	USB_OTG_FS_DM	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b>	USB_DM

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
					*	
	PA10	USB_OTG_FS_ID	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	USB_ID
GPIO	PE2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	IST_RESET
	PD6	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	SYS_CFG
	PI7	GPIO_Analog	Analog mode	No pull-up and no pull-down	n/a	PIN_Y
	PI6	GPIO_Analog	Analog mode	No pull-up and no pull-down	n/a	PIN_X
	PI5	GPIO_Analog	Analog mode	No pull-up and no pull-down	n/a	PIN_W
	PI2	GPIO_Analog	Analog mode	No pull-up and no pull-down	n/a	PIN_Z
	PI0	GPIO_Analog	Analog mode	No pull-up and no pull-down	n/a	PIN_A
	PH2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	POWER1_CTRL
	PH3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	POWER2_CTRL
	PH4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	POWER3_CTRL
	PG8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_A
	PH5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	POWER4_CTRL
	PG7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_B
	PG6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_C
	PF6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	SPI5_NSS
	PH12	GPIO_Analog	Analog mode	No pull-up and no pull-down	n/a	PIN_B
	PG5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_D
	PG4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_E
	PG3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_F
	PF10	GPIO_EXTI10	External Interrupt Mode with Rising edge trigger detection	<b>Pull-up *</b>	n/a	TRIG
	PH11	GPIO_Analog	Analog mode	No pull-up and no pull-down	n/a	PIN_C
	PH10	GPIO_Analog	Analog mode	No pull-up and no pull-down	n/a	PIN_D
	PD15	GPIO_Analog	Analog mode	No pull-up and no pull-down	n/a	PIN_E
	PG2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_G
	PB2/BOOT1	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	KEY
	PG1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_H
	PD14	GPIO_Analog	Analog mode	No pull-up and no pull-down	n/a	PIN_F
	PD13	GPIO_Analog	Analog mode	No pull-up and no pull-down	n/a	PIN_G
	PA1	GPIO_Analog	Analog mode	No pull-up and no pull-down	n/a	PIN_S
	PA0/WKUP	GPIO_Analog	Analog mode	No pull-up and no pull-down	n/a	PIN_T
	PD12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	IO_PROBE
	PA2	GPIO_Analog	Analog mode	No pull-up and no pull-down	n/a	PIN_U
	PE11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_RED
	PA3	GPIO_Analog	Analog mode	No pull-up and no pull-down	n/a	PIN_V
	PF14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_GREEN
	PE15	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	SD_EXTI





### 3.2. DMA configuration

DMA request	Stream	Direction	Priority
USART6_RX	DMA2_Stream1	Peripheral To Memory	Low
USART6_TX	DMA2_Stream6	Memory To Peripheral	Low

#### USART6\_RX: DMA2\_Stream1 DMA request Settings:

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

#### USART6\_TX: DMA2\_Stream6 DMA request Settings:

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

### 3.3. NVIC configuration

#### 3.3.1. 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	15	0
System tick timer	true	15	0
CAN1 TX interrupts	true	5	0
CAN1 RX0 interrupts	true	5	0
TIM2 global interrupt	true	5	0
EXTI line[15:10] interrupts	true	5	0
TIM5 global interrupt	true	0	0
DMA2 stream1 global interrupt	true	5	0
DMA2 stream6 global interrupt	true	5	0
USART6 global interrupt	true	5	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
CAN1 RX1 interrupt	unused		
CAN1 SCE 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		
TIM3 global interrupt	unused		
TIM8 break interrupt and TIM12 global interrupt	unused		
SDIO global interrupt	unused		
FPU global interrupt	unused		
SPI5 global interrupt	unused		

#### 3.3.2. NVIC Code generation

Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler

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
Pre-fetch fault, memory access fault	false	true	false
Undefined instruction or illegal state	false	true	false
System service call via SWI instruction	false	false	false
Debug monitor	false	true	false
Pendable request for system service	false	false	false
System tick timer	false	false	true
CAN1 TX interrupts	false	true	true
CAN1 RX0 interrupts	false	true	true
TIM2 global interrupt	false	true	true
EXTI line[15:10] interrupts	false	true	true
TIM5 global interrupt	false	true	true
DMA2 stream1 global interrupt	false	true	true
DMA2 stream6 global interrupt	false	true	true
USART6 global interrupt	false	true	true

\* User modified value

## 4. System Views

### 4.1. Category view

#### 4.1.1. Current

##### Middleware

FATFS ✓

FREERTOS ✓

##### System Core

##### Analog

##### Timers

##### Connectivity

##### Multimedia

##### Security

##### Computing

DMA ✓

GPIO ✓

NVIC ✓

RCC ✓

SYS ✓

TIM1 ✓

TIM2 ✓

TIM3 ✓

TIM12 ✓

CAN1 ✓

SDIO ✓

SPI5 ✓

USART6 ✓

USB\_FS ✓

## 5. Docs & Resources

Type	Link
BSDL files	<a href="https://www.st.com/resource/en/bsdl_model/stm32f427-437_429-439_bsdl.zip">https://www.st.com/resource/en/bsdl_model/stm32f427-437_429-439_bsdl.zip</a>
IBIS models	<a href="https://www.st.com/resource/en/ibis_model/stm32f427-437_429-439_ibis.zip">https://www.st.com/resource/en/ibis_model/stm32f427-437_429-439_ibis.zip</a>
System View Description	<a href="https://www.st.com/resource/en/svd/stm32f4_svd.zip">https://www.st.com/resource/en/svd/stm32f4_svd.zip</a>
Presentations	<a href="https://www.st.com/resource/en/product_presentation/stm32-stm8_embedded_software_solutions.pdf">https://www.st.com/resource/en/product_presentation/stm32-stm8_embedded_software_solutions.pdf</a>
Presentations	<a href="https://www.st.com/resource/en/product_presentation/stm32_eval_tools_portfolio.pdf">https://www.st.com/resource/en/product_presentation/stm32_eval_tools_portfolio.pdf</a>
Presentations	<a href="https://www.st.com/resource/en/product_presentation/stm32_stm8_functional-safety-packages.pdf">https://www.st.com/resource/en/product_presentation/stm32_stm8_functional-safety-packages.pdf</a>
Presentations	<a href="https://www.st.com/resource/en/product_presentation/stm32-stm8_software_development_tools.pdf">https://www.st.com/resource/en/product_presentation/stm32-stm8_software_development_tools.pdf</a>
Presentations	<a href="https://www.st.com/resource/en/product_presentation/microcontrollers-stm32-family-overview.pdf">https://www.st.com/resource/en/product_presentation/microcontrollers-stm32-family-overview.pdf</a>
Brochures	<a href="https://www.st.com/resource/en/brochure/products-and-solutions-for-plcs-and-smart-i-os.pdf">https://www.st.com/resource/en/brochure/products-and-solutions-for-plcs-and-smart-i-os.pdf</a>
Flyers	<a href="https://www.st.com/resource/en/flyer/flstm32nucleo.pdf">https://www.st.com/resource/en/flyer/flstm32nucleo.pdf</a>
Flyers	<a href="https://www.st.com/resource/en/flyer/flstmcsuite.pdf">https://www.st.com/resource/en/flyer/flstmcsuite.pdf</a>
Flyers	<a href="https://www.st.com/resource/en/flyer/flstm32trust.pdf">https://www.st.com/resource/en/flyer/flstm32trust.pdf</a>
Product Certifications	<a href="https://www.st.com/resource/en/certification_document/stm32_authentication_can.pdf">https://www.st.com/resource/en/certification_document/stm32_authentication_can.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an1181-electrostatic-discharge-sensitivity-measurement-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an1181-electrostatic-discharge-sensitivity-measurement-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an1709-emc-design-guide-for-stm8-stm32-and-legacy-mcus-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an1709-emc-design-guide-for-stm8-stm32-and-legacy-mcus-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an2606-stm32-microcontroller-system-memory-boot-mode-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an2606-stm32-microcontroller-system-memory-boot-mode-stmicroelectronics.pdf</a>

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