

## 1. Description

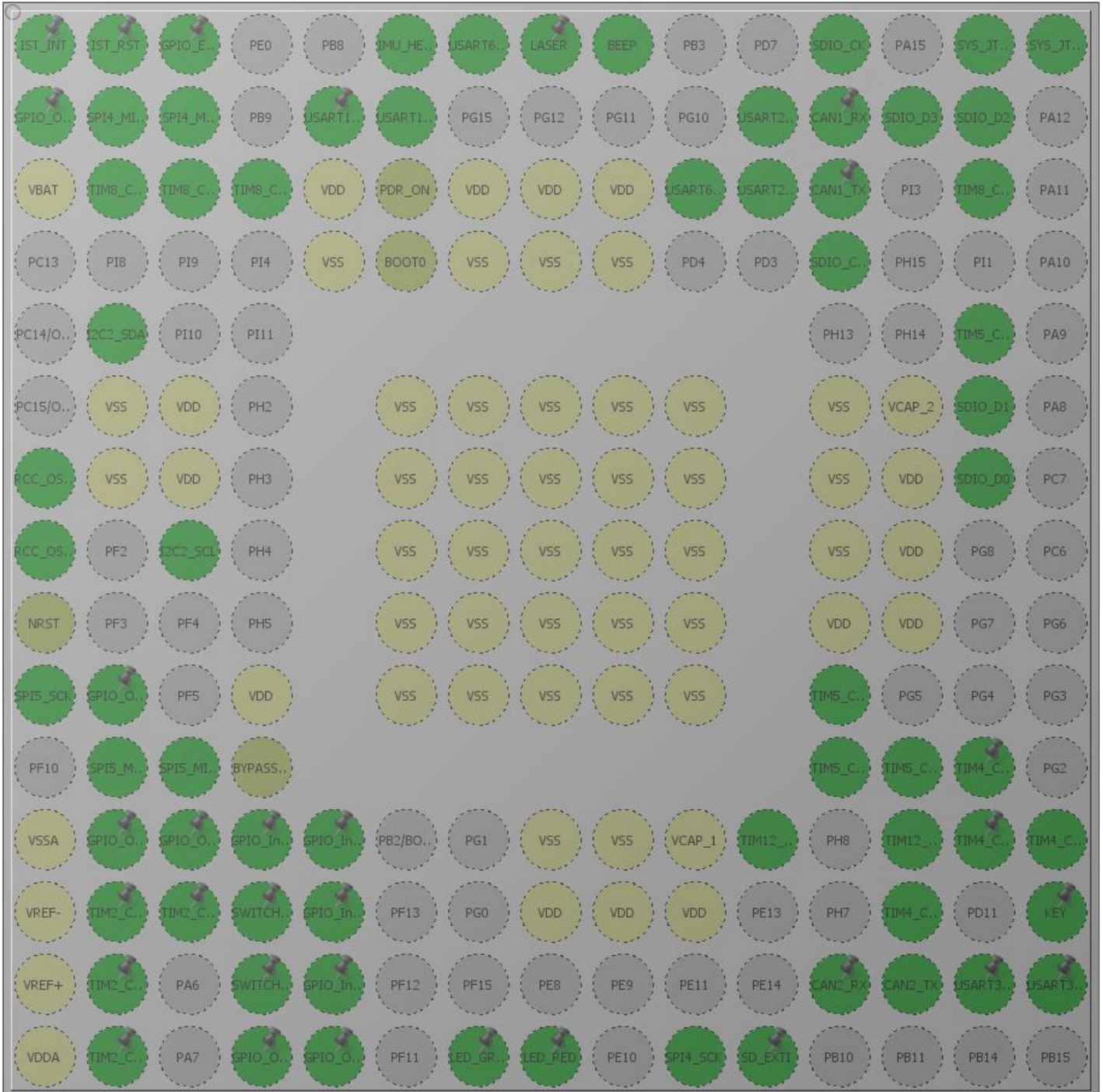
### 1.1. Project

Project Name	iRM_Embedded
Board Name	iRM_Embedded
Generated with:	STM32CubeMX 4.23.0
Date	04/21/2018

### 1.2. MCU

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

## 2. Pinout Configuration



STM32F427IIHx  
UFBGA176 +25 (Top view)

### 3. Pins Configuration

Pin Number UFBGA176	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
A1	PE3 *	I/O	GPIO_Output	IST_INT
A2	PE2 *	I/O	GPIO_Output	IST_RST
A3	PE1	I/O	GPIO_EXTI1	
A6	PB5	I/O	TIM3_CH2	IMU_HEAT_PWM
A7	PG14	I/O	USART6_TX	
A8	PG13 *	I/O	GPIO_Output	LASER
A9	PB4	I/O	TIM3_CH1	BEEP
A12	PC12	I/O	SDIO_CK	
A14	PA14	I/O	SYS_JTCK-SWCLK	
A15	PA13	I/O	SYS_JTMS-SWDIO	
B1	PE4 *	I/O	GPIO_Output	
B2	PE5	I/O	SPI4_MISO	
B3	PE6	I/O	SPI4_MOSI	
B5	PB7	I/O	USART1_RX	
B6	PB6	I/O	USART1_TX	
B11	PD6	I/O	USART2_RX	
B12	PD0	I/O	CAN1_RX	
B13	PC11	I/O	SDIO_D3	
B14	PC10	I/O	SDIO_D2	
C1	VBAT	Power		
C2	PI7	I/O	TIM8_CH3	
C3	PI6	I/O	TIM8_CH2	
C4	PI5	I/O	TIM8_CH1	
C5	VDD	Power		
C6	PDR_ON	Reset		
C7	VDD	Power		
C8	VDD	Power		
C9	VDD	Power		
C10	PG9	I/O	USART6_RX	
C11	PD5	I/O	USART2_TX	
C12	PD1	I/O	CAN1_TX	
C14	PI2	I/O	TIM8_CH4	
D5	VSS	Power		
D6	BOOT0	Boot		
D7	VSS	Power		
D8	VSS	Power		

Pin Number UFBGA176	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
D9	VSS	Power		
D12	PD2	I/O	SDIO_CMD	
E2	PF0	I/O	I2C2_SDA	
E14	PI0	I/O	TIM5_CH4	
F2	VSS	Power		
F3	VDD	Power		
F6	VSS	Power		
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	
G1	PH0/OSC_IN	I/O	RCC_OSC_IN	
G2	VSS	Power		
G3	VDD	Power		
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	
H3	PF1	I/O	I2C2_SCL	
H6	VSS	Power		
H7	VSS	Power		
H8	VSS	Power		
H9	VSS	Power		
H10	VSS	Power		
H12	VSS	Power		
H13	VDD	Power		
J1	NRST	Reset		
J6	VSS	Power		
J7	VSS	Power		
J8	VSS	Power		
J9	VSS	Power		

Pin Number UFBGA176	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
J10	VSS	Power		
J12	VDD	Power		
J13	VDD	Power		
K1	PF7	I/O	SPI5_SCK	
K2	PF6 *	I/O	GPIO_Output	
K4	VDD	Power		
K6	VSS	Power		
K7	VSS	Power		
K8	VSS	Power		
K9	VSS	Power		
K10	VSS	Power		
K12	PH12	I/O	TIM5_CH3	
L2	PF9	I/O	SPI5_MOSI	
L3	PF8	I/O	SPI5_MISO	
L4	BYPASS_REG	Reset		
L12	PH11	I/O	TIM5_CH2	
L13	PH10	I/O	TIM5_CH1	
L14	PD15	I/O	TIM4_CH4	
M1	VSSA	Power		
M2	PC0 *	I/O	GPIO_Output	
M3	PC1 *	I/O	GPIO_Output	
M4	PC2 *	I/O	GPIO_Input	
M5	PC3 *	I/O	GPIO_Input	
M8	VSS	Power		
M9	VSS	Power		
M10	VCAP_1	Power		
M11	PH6	I/O	TIM12_CH1	
M13	PH9	I/O	TIM12_CH2	
M14	PD14	I/O	TIM4_CH3	
M15	PD13	I/O	TIM4_CH2	
N1	VREF-	Power		
N2	PA1	I/O	TIM2_CH2	
N3	PA0/WKUP	I/O	TIM2_CH1	
N4	PA4	I/O	GPIO_EXTI4	SWITCH_1
N5	PC4 *	I/O	GPIO_Input	
N8	VDD	Power		
N9	VDD	Power		
N10	VDD	Power		
N13	PD12	I/O	TIM4_CH1	

Pin Number UFBGA176	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
N15	PD10 *	I/O	GPIO_Input	KEY
P1	VREF+	Power		
P2	PA2	I/O	TIM2_CH3	
P4	PA5	I/O	GPIO_EXTI5	SWITCH_2
P5	PC5 *	I/O	GPIO_Input	
P12	PB12	I/O	CAN2_RX	
P13	PB13	I/O	CAN2_TX	
P14	PD9	I/O	USART3_RX	
P15	PD8	I/O	USART3_TX	
R1	VDDA	Power		
R2	PA3	I/O	TIM2_CH4	
R4	PB1 *	I/O	GPIO_Output	
R5	PB0 *	I/O	GPIO_Output	
R7	PF14 *	I/O	GPIO_Output	LED_GREEN
R8	PE7 *	I/O	GPIO_Output	LED_RED
R10	PE12	I/O	SPI4_SCK	
R11	PE15	I/O	GPIO_EXTI15	SD_EXTI

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



## 5. IPs and Middleware Configuration

### 5.1. CAN1

mode: Mode

#### 5.1.1. Parameter Settings:

##### Bit Timings Parameters:

Prescaler (for Time Quantum)	3 *
Time Quantum	71.42857142857143 *
Time Quanta in Bit Segment 1	9 Times *
Time Quanta in Bit Segment 2	4 Times *
Time for one Bit	1000
ReSynchronization Jump Width	1 Time

##### Basic Parameters:

Time Triggered Communication Mode	Disable
Automatic Bus-Off Management	Enable *
Automatic Wake-Up Mode	Disable
No-Automatic Retransmission	Disable
Receive Fifo Locked Mode	Disable
Transmit Fifo Priority	Disable

##### Advanced Parameters:

Operating Mode	Normal
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### 5.2. CAN2

mode: Mode

#### 5.2.1. Parameter Settings:

##### Bit Timings Parameters:

Prescaler (for Time Quantum)	3 *
Time Quantum	71.42857142857143 *
Time Quanta in Bit Segment 1	9 Times *
Time Quanta in Bit Segment 2	4 Times *
Time for one Bit	1000



ReSynchronization Jump Width 1 Time

**Basic Parameters:**

Time Triggered Communication Mode Disable

Automatic Bus-Off Management **Enable \***

Automatic Wake-Up Mode Disable

No-Automatic Retransmission Disable

Receive Fifo Locked Mode Disable

Transmit Fifo Priority Disable

**Advanced Parameters:**

Operating Mode Normal

## 5.3. I2C2

### I2C: I2C

#### 5.3.1. 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

## 5.4. RCC

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

#### 5.4.1. 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

## 5.5. SDIO

### Mode: SD 4 bits Wide bus

#### 5.5.1. 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

## 5.6. SPI4

### Mode: Full-Duplex Master

#### 5.6.1. 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

## 5.7. SPI5

**Mode: Full-Duplex Master**

### 5.7.1. 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

## 5.8. SYS

**Debug: Serial Wire**

**Timebase Source: TIM6**

## 5.9. TIM2

**Clock Source : Internal Clock**

**Channel1: PWM Generation CH1**

**Channel2: PWM Generation CH2**

**Channel3: PWM Generation CH3**

**Channel4: PWM Generation CH4**

### 5.9.1. Parameter Settings:

**Counter Settings:**

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 32 bits value )	0
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	Reset (UG bit from TIMx_EGR)

#### PWM Generation Channel 1:

Mode	PWM mode 1
Pulse (32 bits value)	0
Fast Mode	Disable
CH Polarity	High

#### PWM Generation Channel 2:

Mode	PWM mode 1
Pulse (32 bits value)	0
Fast Mode	Disable
CH Polarity	High

#### PWM Generation Channel 3:

Mode	PWM mode 1
Pulse (32 bits value)	0
Fast Mode	Disable
CH Polarity	High

#### PWM Generation Channel 4:

Mode	PWM mode 1
Pulse (32 bits value)	0
Fast Mode	Disable
CH Polarity	High

## 5.10. TIM3

**Clock Source : Internal Clock**

**Channel1: PWM Generation CH1**

**Channel2: PWM Generation CH2**

### 5.10.1. Parameter Settings:

#### Counter Settings:

Prescaler (PSC - 16 bits value)	<b>83 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value )	0

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

Reset (UG bit from TIMx\_EGR)

#### PWM Generation Channel 1:

Mode

PWM mode 1

Pulse (16 bits value)

0

Fast Mode

Disable

CH Polarity

High

#### PWM Generation Channel 2:

Mode

PWM mode 1

Pulse (16 bits value)

0

Fast Mode

Disable

CH Polarity

High

## 5.11. TIM4

**Clock Source : Internal Clock**

**Channel1: PWM Generation CH1**

**Channel2: PWM Generation CH2**

**Channel3: PWM Generation CH3**

**Channel4: PWM Generation CH4**

### 5.11.1. Parameter Settings:

#### Counter Settings:

Prescaler (PSC - 16 bits value)

0

Counter Mode

Up

Counter Period (AutoReload Register - 16 bits value )

0

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

Reset (UG bit from TIMx\_EGR)

#### PWM Generation Channel 1:

Mode

PWM mode 1

Pulse (16 bits value)

0

Fast Mode

Disable

CH Polarity

High

#### PWM Generation Channel 2:

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

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

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

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

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

## **5.12. TIM5**

**mode: Clock Source**

**Channel1: PWM Generation CH1**

**Channel2: PWM Generation CH2**

**Channel3: PWM Generation CH3**

**Channel4: PWM Generation CH4**

### **5.12.1. Parameter Settings:**

#### **Counter Settings:**

Prescaler (PSC - 16 bits value)	<b>89 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 32 bits value )	<b>2499 *</b>
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	Reset (UG bit from TIMx_EGR)

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

Mode	PWM mode 1
Pulse (32 bits value)	<b>1000 *</b>
Fast Mode	Disable
CH Polarity	High

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

Mode	PWM mode 1
Pulse (32 bits value)	<b>1000 *</b>
Fast Mode	Disable
CH Polarity	High

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

Mode	PWM mode 1
Pulse (32 bits value)	0
Fast Mode	Disable
CH Polarity	High

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

Mode	PWM mode 1
Pulse (32 bits value)	0
Fast Mode	Disable
CH Polarity	High

### **5.13. TIM8**

**Clock Source : Internal Clock**

**Channel1: PWM Generation CH1**

**Channel2: PWM Generation CH2**

**Channel3: PWM Generation CH3**

**Channel4: PWM Generation CH4**

#### **5.13.1. Parameter Settings:**

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

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value )	0
Internal Clock Division (CKD)	No Division
Repetition Counter (RCR - 8 bits value)	0

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

Master/Slave Mode	Disable (no sync between this TIM (Master) and its Slaves)
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
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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)	0
Fast Mode	Disable
CH Polarity	High
CH Idle State	Reset

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

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

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

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

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

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

## **5.14. TIM12**

**mode: Clock Source**

**Channel1: PWM Generation CH1**

**Channel2: PWM Generation CH2**

### **5.14.1. Parameter Settings:**

#### **Counter Settings:**

Prescaler (PSC - 16 bits value)	<b>89 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value )	<b>2499 *</b>



Internal Clock Division (CKD)

No Division

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

Mode

PWM mode 1

Pulse (16 bits value)

**1000 \***

Fast Mode

Disable

CH Polarity

High

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

Mode

PWM mode 1

Pulse (16 bits value)

**1000 \***

Fast Mode

Disable

CH Polarity

High

## **5.15. USART1**

**Mode: Asynchronous**

### **5.15.1. Parameter Settings:**

#### **Basic Parameters:**

Baud Rate

**100000 \***

Word Length

8 Bits (including Parity)

Parity

**Even \***

Stop Bits

1

#### **Advanced Parameters:**

Data Direction

Receive and Transmit

Over Sampling

16 Samples

## **5.16. USART2**

**Mode: Asynchronous**

### **5.16.1. 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

## 5.17. USART3

**Mode: Asynchronous**

### 5.17.1. 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

## 5.18. USART6

**Mode: Asynchronous**

### 5.18.1. 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

## 5.19. FATFS

## mode: SD Card

### 5.19.1. 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)	Disabled
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
NORTC_YEAR (Year for timestamp)	2015
NORTC_MON (Month for timestamp)	6
NORTC_MDAY (Day for timestamp)	4
FS_REENTRANT (Re-Entrancy)	Enabled
FS_TIMEOUT (Timeout ticks)	1000
SYNC_t (O/S sync object)	osSemaphoreId

FS\_LOCK (Number of files opened simultaneously) 2

### 5.19.2. IPs instances:

#### SDIO/SDMMC:

SDIO instance	SDIO
Use dma template	Enabled

## 5.20. FREERTOS

mode: Enabled

### 5.20.1. 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	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

#### Memory management settings:

Memory Allocation	Dynamic
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	Disabled
USE_DAEMON_TASK_STARTUP_HOOK	Disabled
CHECK_FOR_STACK_OVERFLOW	Disabled

**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

## 5.20.2. Include parameters:

**Include definitions:**

vTaskPrioritySet	Enabled
uxTaskPriorityGet	Enabled
vTaskDelete	Enabled
vTaskCleanUpResources	Disabled
vTaskSuspend	Enabled
vTaskDelayUntil	Disabled
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
CAN1	PD0	CAN1_RX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
	PD1	CAN1_TX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
CAN2	PB12	CAN2_RX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
	PB13	CAN2_TX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
I2C2	PF0	I2C2_SDA	Alternate Function Open Drain	Pull-up	Very High *	
	PF1	I2C2_SCL	Alternate Function Open Drain	Pull-up	Very High *	
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	
SPI4	PE5	SPI4_MISO	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
	PE6	SPI4_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
	PE12	SPI4_SCK	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	Very High *	
	PF9	SPI5_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	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	
TIM2	PA1	TIM2_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA0/WKUP	TIM2_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA2	TIM2_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA3	TIM2_CH4	Alternate Function Push Pull	No pull-up and no pull-down	Low	
TIM3	PB5	TIM3_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	IMU_HEAT_PWM
	PB4	TIM3_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	BEEP
TIM4	PD15	TIM4_CH4	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PD14	TIM4_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PD13	TIM4_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PD12	TIM4_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
TIM5	PI0	TIM5_CH4	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PH12	TIM5_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PH11	TIM5_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PH10	TIM5_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
TIM8	PI7	TIM8_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PI6	TIM8_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PI5	TIM8_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PI2	TIM8_CH4	Alternate Function Push Pull	No pull-up and no pull-down	Low	
TIM12	PH6	TIM12_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PH9	TIM12_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	
USART1	PB7	USART1_RX	Alternate Function Push Pull	Pull-up	<b>Very High</b> *	
	PB6	USART1_TX	Alternate Function Push Pull	Pull-up	<b>Very High</b> *	
USART2	PD6	USART2_RX	Alternate Function Push Pull	Pull-up	<b>Very High</b> *	
	PD5	USART2_TX	Alternate Function Push Pull	Pull-up	<b>Very High</b> *	
USART3	PD9	USART3_RX	Alternate Function Push Pull	Pull-up	<b>Very High</b> *	
	PD8	USART3_TX	Alternate Function Push Pull	Pull-up	<b>Very High</b> *	
USART6	PG14	USART6_TX	Alternate Function Push Pull	Pull-up	<b>Very High</b>	



IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
					*	
	PG9	USART6_RX	Alternate Function Push Pull	Pull-up	Very High *	
GPIO	PE3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	IST_INT
	PE2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	IST_RST
	PE1	GPIO_EXTI1	<b>External Interrupt Mode with Falling edge trigger detection</b>	<b>Pull-up *</b>	n/a	
	PG13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LASER
	PE4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PF6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PC0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PC1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PC2	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PC3	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PA4	GPIO_EXTI4	<b>External Interrupt Mode with Rising/Falling edge</b>	<b>Pull-up *</b>	n/a	SWITCH_1
	PC4	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PD10	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	KEY
	PA5	GPIO_EXTI5	<b>External Interrupt Mode with Rising/Falling edge</b>	<b>Pull-up *</b>	n/a	SWITCH_2
	PC5	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PB1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PB0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PF14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_GREEN
	PE7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_RED
	PE15	GPIO_EXTI15	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	SD_EXTI

## 6.2. DMA configuration

DMA request	Stream	Direction	Priority
USART6_RX	DMA2_Stream1	Peripheral To Memory	Low
USART1_RX	DMA2_Stream2	Peripheral To Memory	<b>Very High *</b>
USART2_RX	DMA1_Stream5	Peripheral To Memory	Low
USART3_RX	DMA1_Stream1	Peripheral To Memory	Low

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

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

### USART1\_RX: DMA2\_Stream2 DMA request Settings:

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

### USART2\_RX: DMA1\_Stream5 DMA request Settings:

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

### USART3\_RX: DMA1\_Stream1 DMA request Settings:

Mode: Normal

Use fifo:	Disable
Peripheral Increment:	Disable
Memory Increment:	<b>Enable *</b>
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 stream1 global interrupt	true	5	0
DMA1 stream5 global interrupt	true	5	0
CAN1 TX interrupts	true	5	0
CAN1 RX0 interrupts	true	5	0
USART1 global interrupt	true	5	0
USART2 global interrupt	true	5	0
USART3 global interrupt	true	5	0
SDIO global interrupt	true	5	0
TIM6 global interrupt, DAC1 and DAC2 underrun error interrupts	true	0	0
DMA2 stream1 global interrupt	true	5	0
DMA2 stream2 global interrupt	true	5	0
CAN2 TX interrupts	true	6	0
CAN2 RX0 interrupts	true	6	0
USART6 global interrupt	true	5	0
PVD interrupt through EXTI line 16		unused	
Flash global interrupt		unused	
RCC global interrupt		unused	
EXTI line1 interrupt		unused	
EXTI line4 interrupt		unused	
CAN1 RX1 interrupt		unused	
CAN1 SCE interrupt		unused	
EXTI line[9:5] interrupts		unused	
TIM2 global interrupt		unused	
TIM3 global interrupt		unused	
TIM4 global interrupt		unused	
I2C2 event interrupt		unused	
I2C2 error interrupt		unused	
EXTI line[15:10] interrupts		unused	
TIM8 break interrupt and TIM12 global interrupt		unused	

Interrupt Table	Enable	Preenmption Priority	SubPriority
TIM8 update interrupt and TIM13 global interrupt		unused	
TIM8 trigger and commutation interrupts and TIM14 global interrupt		unused	
TIM8 capture compare interrupt		unused	
TIM5 global interrupt		unused	
CAN2 RX1 interrupt		unused	
CAN2 SCE interrupt		unused	
FPU global interrupt		unused	
SPI4 global interrupt		unused	
SPI5 global interrupt		unused	

\* User modified value

## ***7. Power Consumption Calculator report***

### 7.1. Microcontroller Selection

Series	STM32F4
Line	STM32F427/437
MCU	STM32F427IIHx
Datasheet	024030_Rev9

### 7.2. Parameter Selection

Temperature	25
Vdd	null

## 8. Software Project

### 8.1. Project Settings

Name	Value
Project Name	iRM_Embedded
Project Folder	\\Mac\Home\Documents\GitHub\iRM_Embedded
Toolchain / IDE	SW4STM32
Firmware Package Name and Version	STM32Cube FW_F4 V1.18.0

### 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