1. Description

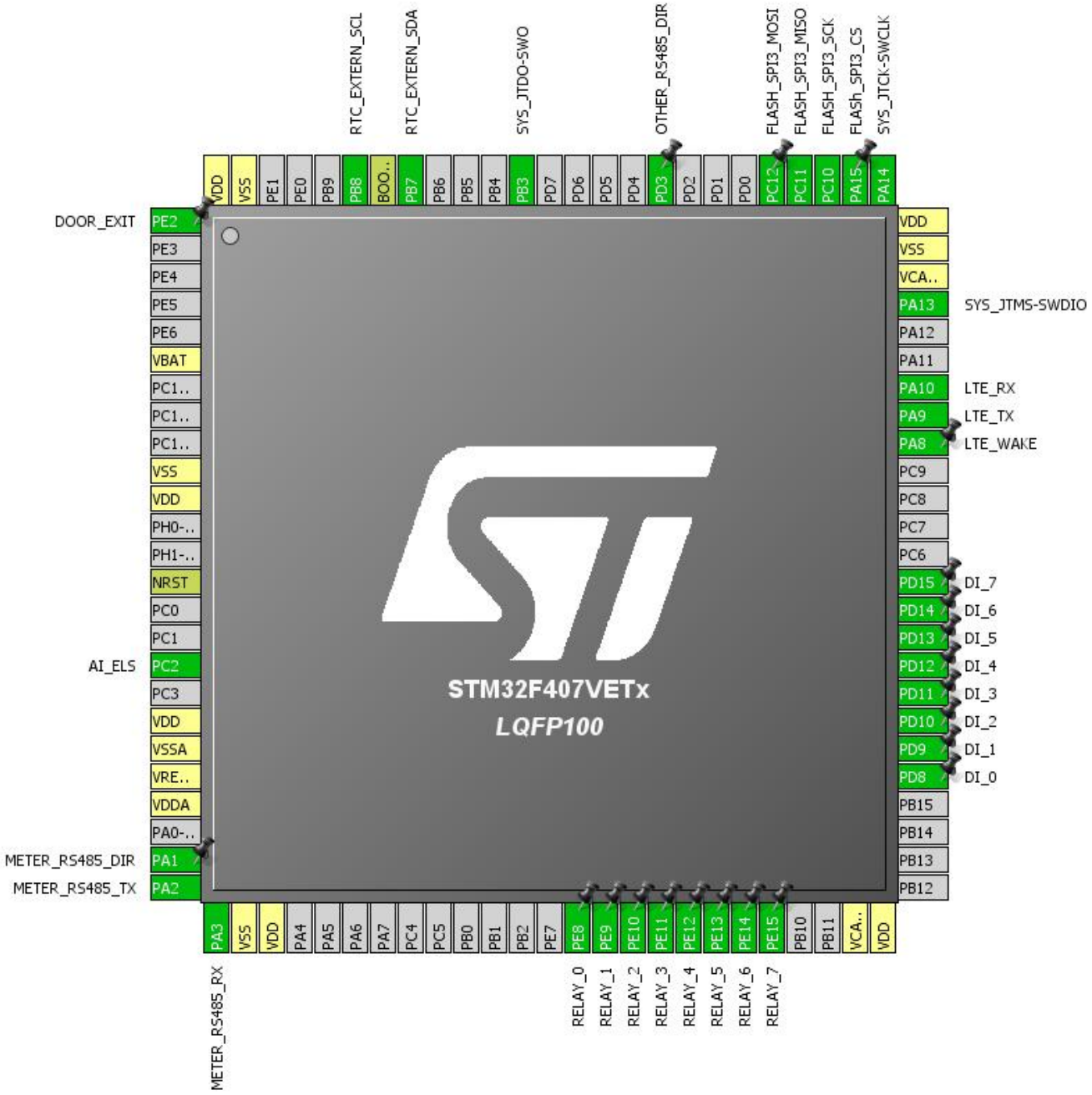
1.1. Project

Project Name	sh-z-003
Board Name	custom
Generated with:	STM32CubeMX 4.26.1
Date	08/26/2018

1.2. MCU

MCU Series	STM32F4
MCU Line	STM32F407/417
MCU name	STM32F407VETx
MCU Package	LQFP100
MCU Pin number	100

2. Pinout Configuration



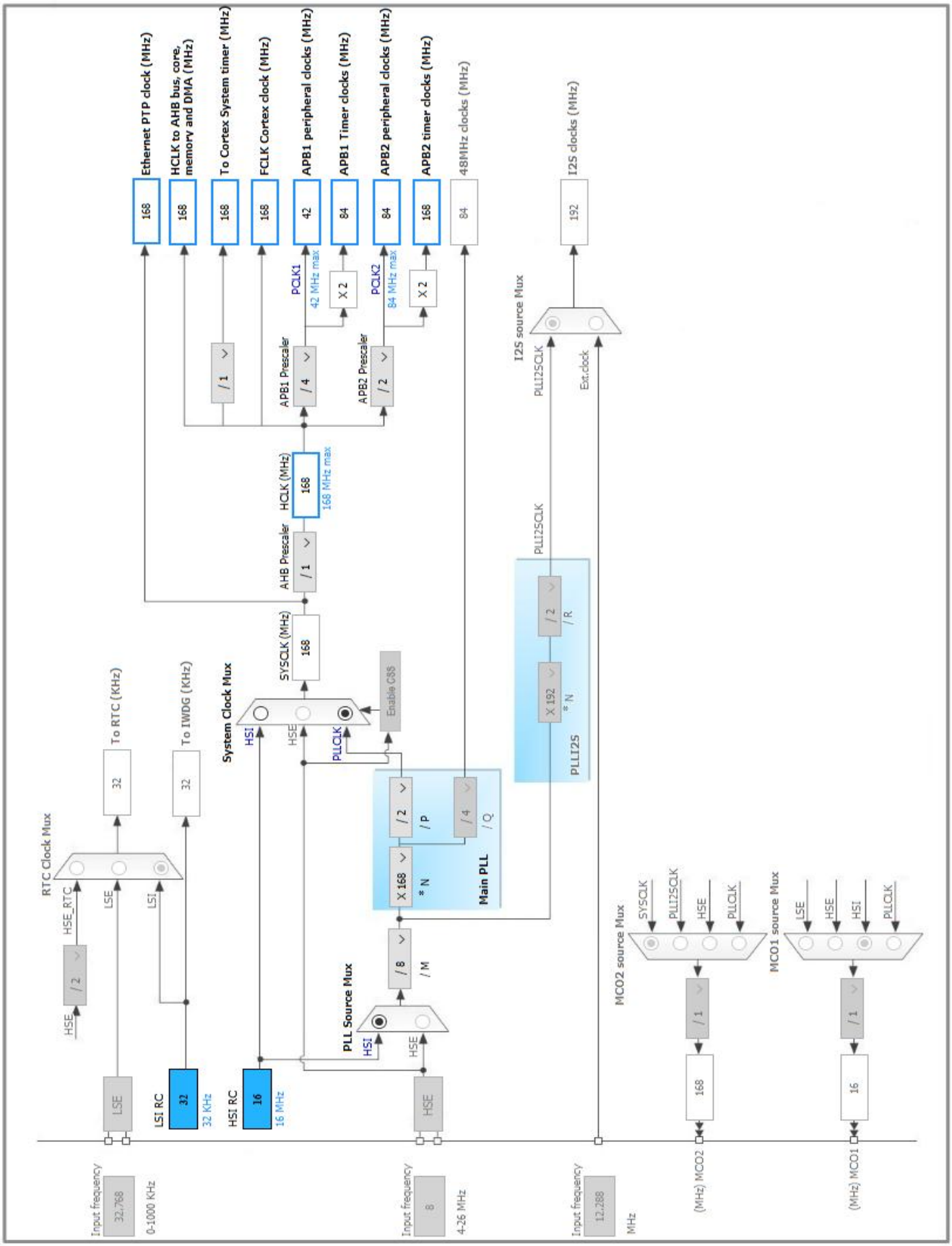
3. Pins Configuration

Pin Number LQFP100	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	PE2 *	I/O	GPIO_Input	DOOR_EXIT
6	VBAT	Power		
10	VSS	Power		
11	VDD	Power		
14	NRST	Reset		
17	PC2	I/O	ADC3_IN12	AI_ELS
19	VDD	Power		
20	VSSA	Power		
21	VREF+	Power		
22	VDDA	Power		
24	PA1 *	I/O	GPIO_Output	METER_RS485_DIR
25	PA2	I/O	USART2_TX	METER_RS485_TX
26	PA3	I/O	USART2_RX	METER_RS485_RX
27	VSS	Power		
28	VDD	Power		
39	PE8 *	I/O	GPIO_Output	RELAY_0
40	PE9 *	I/O	GPIO_Output	RELAY_1
41	PE10 *	I/O	GPIO_Output	RELAY_2
42	PE11 *	I/O	GPIO_Output	RELAY_3
43	PE12 *	I/O	GPIO_Output	RELAY_4
44	PE13 *	I/O	GPIO_Output	RELAY_5
45	PE14 *	I/O	GPIO_Output	RELAY_6
46	PE15 *	I/O	GPIO_Output	RELAY_7
49	VCAP_1	Power		
50	VDD	Power		
55	PD8 *	I/O	GPIO_Input	DI_0
56	PD9 *	I/O	GPIO_Input	DI_1
57	PD10 *	I/O	GPIO_Input	DI_2
58	PD11 *	I/O	GPIO_Input	DI_3
59	PD12 *	I/O	GPIO_Input	DI_4
60	PD13 *	I/O	GPIO_Input	DI_5
61	PD14 *	I/O	GPIO_Input	DI_6
62	PD15 *	I/O	GPIO_Input	DI_7
67	PA8 *	I/O	GPIO_Output	LTE_WAKE
68	PA9	I/O	USART1_TX	LTE_TX
69	PA10	I/O	USART1_RX	LTE_RX

Pin Number LQFP100	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
72	PA13	I/O	SYS_JTMS-SWDIO	
73	VCAP_2	Power		
74	VSS	Power		
75	VDD	Power		
76	PA14	I/O	SYS_JTCK-SWCLK	
77	PA15 *	I/O	GPIO_Output	FLASh_SPI3_CS
78	PC10	I/O	SPI3_SCK	FLASH_SPI3_SCK
79	PC11	I/O	SPI3_MISO	FLASH_SPI3_MISO
80	PC12	I/O	SPI3_MOSI	FLASH_SPI3_MOSI
84	PD3 *	I/O	GPIO_Output	OTHER_RS485_DIR
89	PB3	I/O	SYS_JTDO-SWO	
93	PB7	I/O	I2C1_SDA	RTC_EXTERN_SDA
94	BOOT0	Boot		
95	PB8	I/O	I2C1_SCL	RTC_EXTERN_SCL
99	VSS	Power		
100	VDD	Power		

* The pin is affected with an I/O function

4. Clock Tree Configuration



5. IPs and Middleware Configuration

5.1. ADC3

mode: IN12

5.1.1. Parameter Settings:

ADCs_Common_Settings:

Mode	Independent mode

ADC_Settings:

Clock Prescaler	PCLK2 divided by 4
Resolution	12 bits (15 ADC Clock cycles)
Data Alignment	Right alignment
Scan Conversion Mode	Disabled
Continuous Conversion Mode	Disabled
Discontinuous Conversion Mode	Disabled
DMA Continuous Requests	Disabled
End Of Conversion Selection	EOC flag at the end of single channel conversion

ADC_Regular_ConversionMode:

Number Of Conversion	1
External Trigger Conversion Source	Regular Conversion launched by software
External Trigger Conversion Edge	None
Rank	1
Channel	Channel 12
Sampling Time	3 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	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

5.3. SPI3

Mode: Full-Duplex Master

5.3.1. Parameter Settings:

Basic Parameters:

Frame Format	Motorola
Data Size	8 Bits
First Bit	MSB First

Clock Parameters:

Prescaler (for Baud Rate)	2
Baud Rate	**21.0 MBits/s ***
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

5.4. SYS

Debug: Trace Asynchronous Sw

Timebase Source: TIM1

5.5. USART1

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. USART2

Mode: Asynchronous

5.6.1. 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

5.7. FREERTOS

mode: Enabled

5.7.1. 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	**32768 ***
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

Interrupt nesting behaviour configuration:

LIBRARY_LOWEST_INTERRUPT_PRIORITY	15
LIBRARY_MAX_SYSCALL_INTERRUPT_PRIORITY	5

5.7.2. 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
ADC3	PC2	ADC3_IN12	Analog mode	No pull-up and no pull-down	n/a	AI_ELS
I2C1	PB7	I2C1_SDA	Alternate Function Open Drain	Pull-up	**Very High ***	RTC_EXTERN_SDA
	PB8	I2C1_SCL	Alternate Function Open Drain	Pull-up	**Very High ***	RTC_EXTERN_SCL
SPI3	PC10	SPI3_SCK	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	FLASH_SPI3_SCK
	PC11	SPI3_MISO	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	FLASH_SPI3_MISO
	PC12	SPI3_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	FLASH_SPI3_MOSI
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
	PB3	SYS_JTDO-SWO	n/a	n/a	n/a	
USART1	PA9	USART1_TX	Alternate Function Push Pull	Pull-up	**Very High ***	LTE_TX
	PA10	USART1_RX	Alternate Function Push Pull	Pull-up	**Very High ***	LTE_RX
USART2	PA2	USART2_TX	Alternate Function Push Pull	Pull-up	**Very High ***	METER_RS485_TX
	PA3	USART2_RX	Alternate Function Push Pull	Pull-up	**Very High ***	METER_RS485_RX
GPIO	PE2	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	DOOR_EXIT
	PA1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	METER_RS485_DIR
	PE8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RELAY_0
	PE9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RELAY_1
	PE10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RELAY_2
	PE11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RELAY_3
	PE12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RELAY_4
	PE13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RELAY_5
	PE14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RELAY_6
	PE15	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RELAY_7

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PD8	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	DI_0
	PD9	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	DI_1
	PD10	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	DI_2
	PD11	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	DI_3
	PD12	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	DI_4
	PD13	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	DI_5
	PD14	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	DI_6
	PD15	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	DI_7
	PA8	GPIO_Output	**Output Open Drain ***	**Pull-up ***	Low	LTE_WAKE
	PA15	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	FLASh_SPI3_CS
	PD3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	OTHER_RS485_DIR

6.2. DMA configuration

DMA request	Stream	Direction	Priority
USART1_TX	DMA2_Stream7	Memory To Peripheral	**Medium ***

USART1_TX: DMA2_Stream7 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
TIM1 update interrupt and TIM10 global interrupt	true	0	0
USART1 global interrupt	true	10	0
DMA2 stream7 global interrupt	true	9	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
ADC1, ADC2 and ADC3 global interrupts	unused		
I2C1 event interrupt	unused		
I2C1 error interrupt	unused		
USART2 global interrupt	unused		
SPI3 global interrupt	unused		
FPU global interrupt	unused		

*** User modified value**

7. Power Consumption Calculator report

7.1. Microcontroller Selection

Series	STM32F4
Line	STM32F407/417
MCU	STM32F407VETx
Datasheet	022152_Rev8

7.2. Parameter Selection

Temperature	25
Vdd	3.3

8. Software Project

8.1. Project Settings

Name	Value
Project Name	sh-z-003
Project Folder	G:\Work\sh-z-003\design\code\v1\sh-z-003
Toolchain / IDE	MDK-ARM V5
Firmware Package Name and Version	STM32Cube FW_F4 V1.21.0

8.2. Code Generation Settings

Name	Value
STM32Cube Firmware Library Package	Copy all used libraries into the project folder
Generate peripheral initialization as a pair of '.c/.h' files	No
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

9. Software Pack Report