1. Description

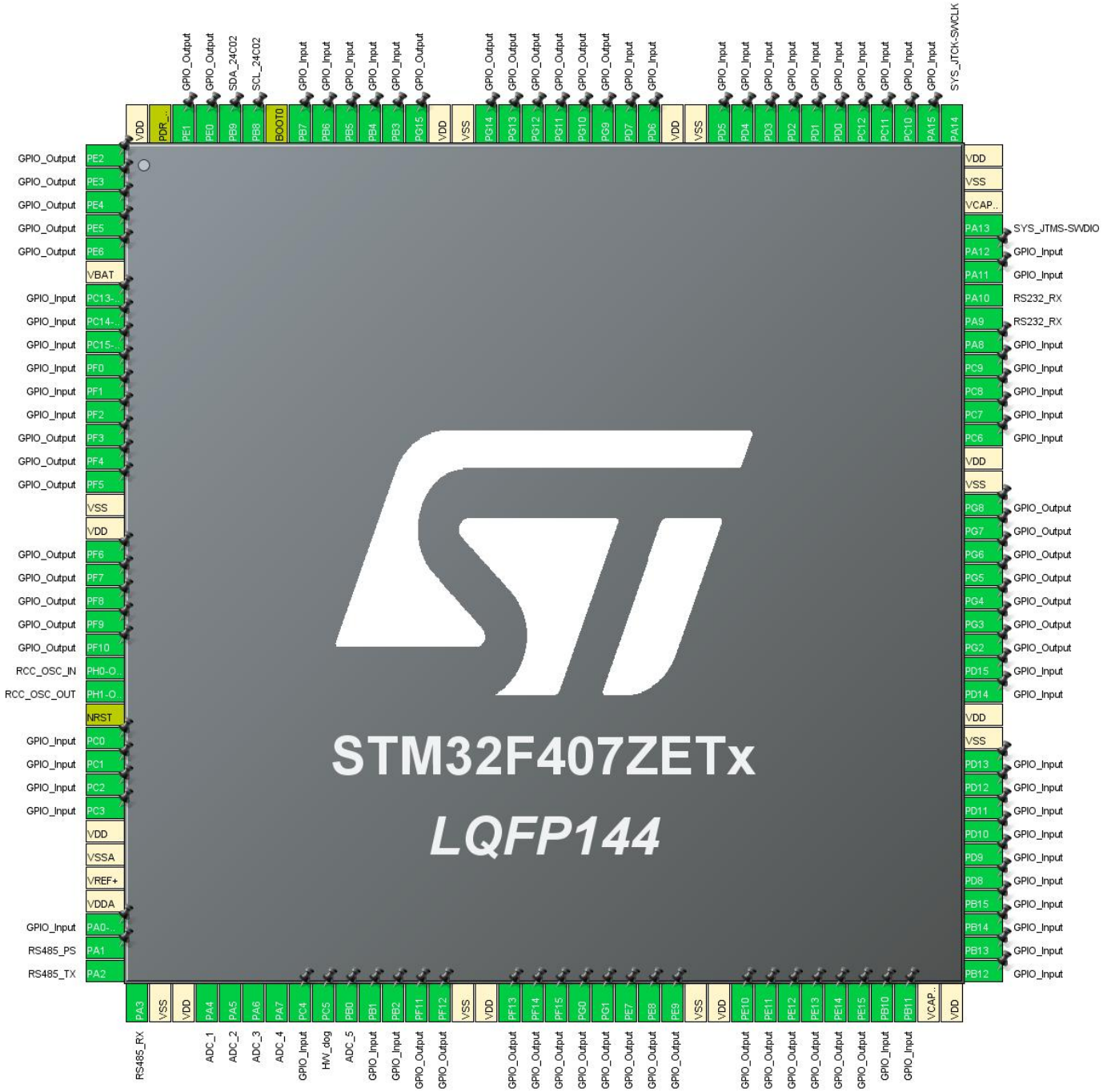
1.1. Project

Project Name	slave_code
Board Name	custom
Generated with:	STM32CubeMX 5.6.1
Date	07/12/2022

1.2. MCU

MCU Series	STM32F4
MCU Line	STM32F407/417
MCU name	STM32F407ZETx
MCU Package	LQFP144
MCU Pin number	144

2. Pinout Configuration



3. Pins Configuration

Pin Number LQFP144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	PE2 *	I/O	GPIO_Output	
2	PE3 *	I/O	GPIO_Output	
3	PE4 *	I/O	GPIO_Output	
4	PE5 *	I/O	GPIO_Output	
5	PE6 *	I/O	GPIO_Output	
6	VBAT	Power		
7	PC13-ANTI_TAMP *	I/O	GPIO_Input	
8	PC14-OSC32_IN *	I/O	GPIO_Input	
9	PC15-OSC32_OUT *	I/O	GPIO_Input	
10	PF0 *	I/O	GPIO_Input	
11	PF1 *	I/O	GPIO_Input	
12	PF2 *	I/O	GPIO_Input	
13	PF3 *	I/O	GPIO_Output	
14	PF4 *	I/O	GPIO_Output	
15	PF5 *	I/O	GPIO_Output	
16	VSS	Power		
17	VDD	Power		
18	PF6 *	I/O	GPIO_Output	
19	PF7 *	I/O	GPIO_Output	
20	PF8 *	I/O	GPIO_Output	
21	PF9 *	I/O	GPIO_Output	
22	PF10 *	I/O	GPIO_Output	
23	PH0-OSC_IN	I/O	RCC_OSC_IN	
24	PH1-OSC_OUT	I/O	RCC_OSC_OUT	
25	NRST	Reset		
26	PC0 *	I/O	GPIO_Input	
27	PC1 *	I/O	GPIO_Input	
28	PC2 *	I/O	GPIO_Input	
29	PC3 *	I/O	GPIO_Input	
30	VDD	Power		
31	VSSA	Power		
32	VREF+	Power		
33	VDDA	Power		
34	PA0-WKUP *	I/O	GPIO_Input	
35	PA1 *	I/O	GPIO_Output	RS485_PS
36	PA2	I/O	USART2_TX	RS485_TX

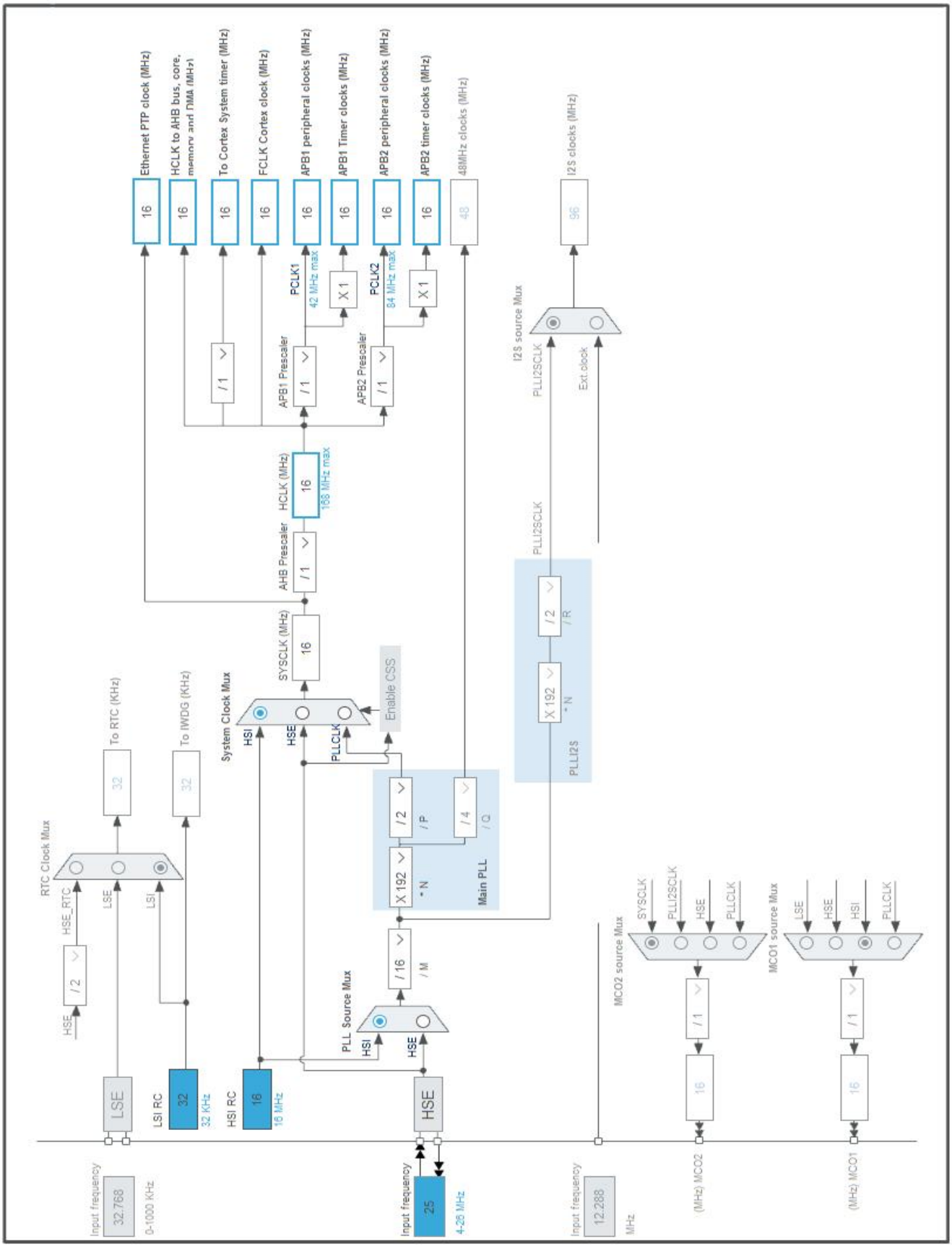
Pin Number LQFP144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
37	PA3	I/O	USART2_RX	RS485_RX
38	VSS	Power		
39	VDD	Power		
40	PA4	I/O	ADC1_IN4	ADC_1
41	PA5	I/O	ADC1_IN5	ADC_2
42	PA6	I/O	ADC1_IN6	ADC_3
43	PA7	I/O	ADC1_IN7	ADC_4
44	PC4 *	I/O	GPIO_Input	
45	PC5 *	I/O	GPIO_Output	HW_dog
46	PB0	I/O	ADC1_IN8	ADC_5
47	PB1 *	I/O	GPIO_Input	
48	PB2 *	I/O	GPIO_Input	
49	PF11 *	I/O	GPIO_Output	
50	PF12 *	I/O	GPIO_Output	
51	VSS	Power		
52	VDD	Power		
53	PF13 *	I/O	GPIO_Output	
54	PF14 *	I/O	GPIO_Output	
55	PF15 *	I/O	GPIO_Output	
56	PG0 *	I/O	GPIO_Output	
57	PG1 *	I/O	GPIO_Output	
58	PE7 *	I/O	GPIO_Output	
59	PE8 *	I/O	GPIO_Output	
60	PE9 *	I/O	GPIO_Output	
61	VSS	Power		
62	VDD	Power		
63	PE10 *	I/O	GPIO_Output	
64	PE11 *	I/O	GPIO_Output	
65	PE12 *	I/O	GPIO_Output	
66	PE13 *	I/O	GPIO_Output	
67	PE14 *	I/O	GPIO_Output	
68	PE15 *	I/O	GPIO_Output	
69	PB10 *	I/O	GPIO_Input	
70	PB11 *	I/O	GPIO_Input	
71	VCAP_1	Power		
72	VDD	Power		
73	PB12 *	I/O	GPIO_Input	
74	PB13 *	I/O	GPIO_Input	
75	PB14 *	I/O	GPIO_Input	

Pin Number LQFP144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
76	PB15 *	I/O	GPIO_Input	
77	PD8 *	I/O	GPIO_Input	
78	PD9 *	I/O	GPIO_Input	
79	PD10 *	I/O	GPIO_Input	
80	PD11 *	I/O	GPIO_Input	
81	PD12 *	I/O	GPIO_Input	
82	PD13 *	I/O	GPIO_Input	
83	VSS	Power		
84	VDD	Power		
85	PD14 *	I/O	GPIO_Input	
86	PD15 *	I/O	GPIO_Input	
87	PG2 *	I/O	GPIO_Output	
88	PG3 *	I/O	GPIO_Output	
89	PG4 *	I/O	GPIO_Output	
90	PG5 *	I/O	GPIO_Output	
91	PG6 *	I/O	GPIO_Output	
92	PG7 *	I/O	GPIO_Output	
93	PG8 *	I/O	GPIO_Output	
94	VSS	Power		
95	VDD	Power		
96	PC6 *	I/O	GPIO_Input	
97	PC7 *	I/O	GPIO_Input	
98	PC8 *	I/O	GPIO_Input	
99	PC9 *	I/O	GPIO_Input	
100	PA8 *	I/O	GPIO_Input	
101	PA9	I/O	USART1_TX	RS232_RX
102	PA10	I/O	USART1_RX	RS232_RX
103	PA11 *	I/O	GPIO_Input	
104	PA12 *	I/O	GPIO_Input	
105	PA13	I/O	SYS_JTMS-SWDIO	
106	VCAP_2	Power		
107	VSS	Power		
108	VDD	Power		
109	PA14	I/O	SYS_JTCK-SWCLK	
110	PA15 *	I/O	GPIO_Input	
111	PC10 *	I/O	GPIO_Input	
112	PC11 *	I/O	GPIO_Input	
113	PC12 *	I/O	GPIO_Input	
114	PD0 *	I/O	GPIO_Input	

Pin Number LQFP144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
115	PD1 *	I/O	GPIO_Input	
116	PD2 *	I/O	GPIO_Input	
117	PD3 *	I/O	GPIO_Input	
118	PD4 *	I/O	GPIO_Input	
119	PD5 *	I/O	GPIO_Input	
120	VSS	Power		
121	VDD	Power		
122	PD6 *	I/O	GPIO_Input	
123	PD7 *	I/O	GPIO_Input	
124	PG9 *	I/O	GPIO_Output	
125	PG10 *	I/O	GPIO_Output	
126	PG11 *	I/O	GPIO_Output	
127	PG12 *	I/O	GPIO_Output	
128	PG13 *	I/O	GPIO_Output	
129	PG14 *	I/O	GPIO_Output	
130	VSS	Power		
131	VDD	Power		
132	PG15 *	I/O	GPIO_Output	
133	PB3 *	I/O	GPIO_Input	
134	PB4 *	I/O	GPIO_Input	
135	PB5 *	I/O	GPIO_Input	
136	PB6 *	I/O	GPIO_Input	
137	PB7 *	I/O	GPIO_Input	
138	BOOT0	Boot		
139	PB8 *	I/O	GPIO_Output	SCL_24C02
140	PB9 *	I/O	GPIO_Input	SDA_24C02
141	PE0 *	I/O	GPIO_Output	
142	PE1 *	I/O	GPIO_Output	
143	PDR_ON	Reset		
144	VDD	Power		

* The pin is affected with an I/O function

4. Clock Tree Configuration



5. Software Project

5.1. Project Settings

Name	Value
Project Name	slave_code
Project Folder	E:\HP\3_project\6 PLCtoARM\slave_code
Toolchain / IDE	EWARM V8.32
Firmware Package Name and Version	STM32Cube FW_F4 V1.25.2

5.2. Code Generation Settings

Name	Value
STM32Cube MCU packages and embedded software	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

6. Power Consumption Calculator report

6.1. Microcontroller Selection

Series	STM32F4
Line	STM32F407/417
MCU	STM32F407ZETx
Datasheet	022152_Rev8

6.2. Parameter Selection

Temperature	25
Vdd	3.3

6.3. 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

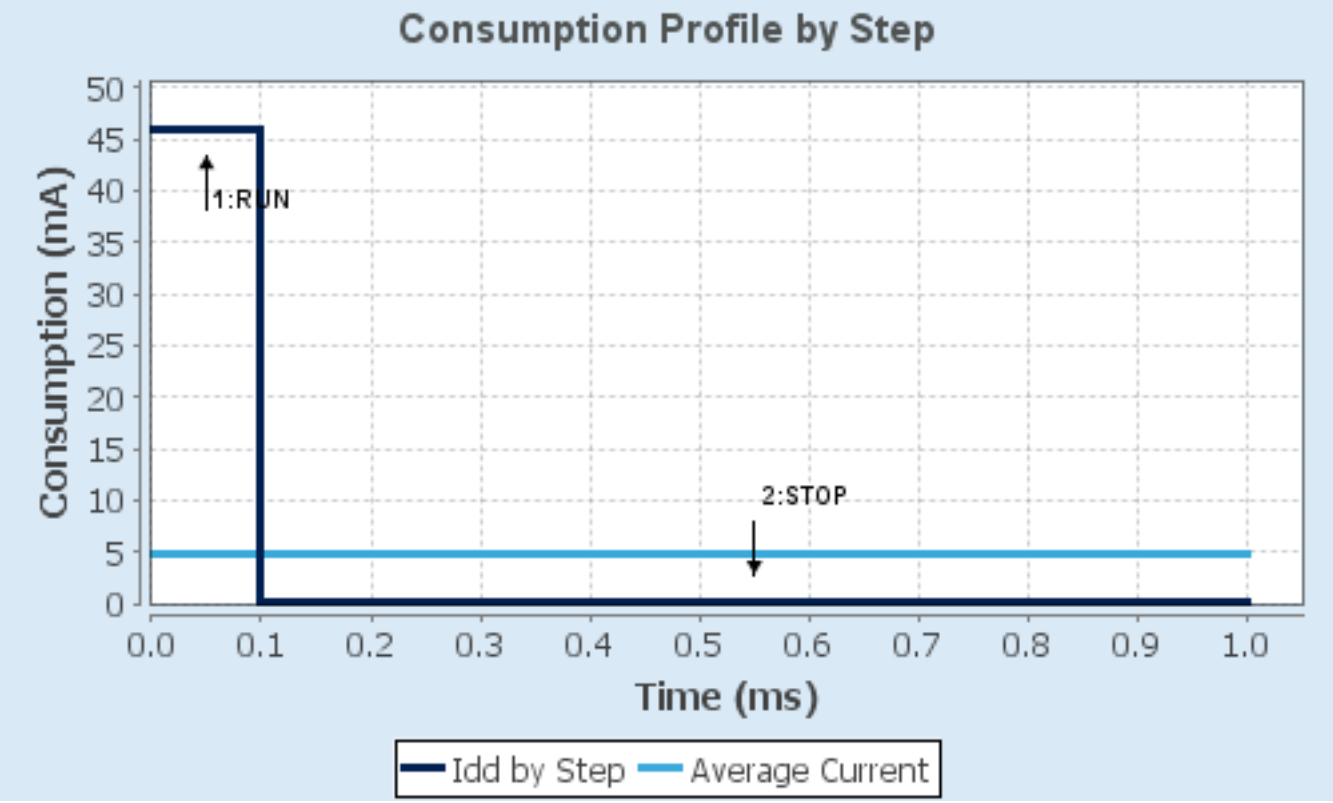
6.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP
Vdd	3.3	3.3
Voltage Source	Battery	Battery
Range	Scale1-High	No Scale
Fetch Type	FLASH	n/a
CPU Frequency	168 MHz	0 Hz
Clock Configuration	HSE PLL	Regulator_LP Flash-PwrDwn
Clock Source Frequency	4 MHz	0 Hz
Peripherals		
Additional Cons.	0 mA	0 mA
Average Current	46 mA	280 µA
Duration	0.1 ms	0.9 ms
DMIPS	210.0	0.0
Ta Max	98.93	104.96
Category	In DS Table	In DS Table

6.5. RESULTS

Sequence Time	1 ms	Average Current	4.85 mA
Battery Life	29 days, 4 hours	Average DMIPS	210.0 DMIPS

6.6. Chart


Consumption Profile by Step
Consumption (mA)
50
45
40
35
30
25
20
15
10
5
0
1:RUN
2:STOP
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Time (ms)
Idd by Step
Average Current

7. IPs and Middleware Configuration

7.1. ADC1

mode: IN4

mode: IN5

mode: IN6

mode: IN7

mode: IN8

7.1.1. Parameter Settings:

ADCs_Common_Settings:

Mode	Independent mode

ADC_Settings:

Clock Prescaler	PCLK2 divided by 2
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 4
Sampling Time	3 Cycles

ADC_Injected_ConversionMode:

Number Of Conversions	0

WatchDog:

Enable Analog WatchDog Mode	false

7.2. GPIO

7.3. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

7.3.1. Parameter Settings:

System Parameters:

VDD voltage (V)	3.3
Instruction Cache	Enabled
Prefetch Buffer	Enabled
Data Cache	Enabled
Flash Latency(WS)	0 WS (1 CPU cycle)

RCC Parameters:

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

Power Parameters:

Power Regulator Voltage Scale	Power Regulator Voltage Scale 1

7.4. SYS

Debug: Serial Wire

Timebase Source: SysTick

7.5. USART1

Mode: Asynchronous

7.5.1. 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

7.6. USART2

Mode: Asynchronous

7.6.1. 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

*** User modified value**

8. System Configuration

8.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
ADC1	PA4	ADC1_IN4	Analog mode	No pull-up and no pull-down	n/a	ADC_1
	PA5	ADC1_IN5	Analog mode	No pull-up and no pull-down	n/a	ADC_2
	PA6	ADC1_IN6	Analog mode	No pull-up and no pull-down	n/a	ADC_3
	PA7	ADC1_IN7	Analog mode	No pull-up and no pull-down	n/a	ADC_4
	PB0	ADC1_IN8	Analog mode	No pull-up and no pull-down	n/a	ADC_5
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	
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
USART1	PA9	USART1_TX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	RS232_RX
	PA10	USART1_RX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	RS232_RX
USART2	PA2	USART2_TX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	RS485_TX
	PA3	USART2_RX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	RS485_RX
GPIO	PE2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PE3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PE4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PE5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PE6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PC13-ANTI_TAMP	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PC14-OSC32_IN	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PC15-OSC32_OUT	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PF0	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PF1	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PF2	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PF3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PF4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PF5	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	
	PF7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PF8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PF9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PF10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PC0	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PC1	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	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	
	PA0-WKUP	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PA1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RS485_PS
	PC4	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PC5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	HW_dog
	PB1	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PB2	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PF11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PF12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PF13	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	
	PF15	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PG0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PG1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PE7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PE8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PE9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PE10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PE11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PE12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PE13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PE14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PE15	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PB10	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PB11	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PB12	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PB13	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PB14	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PB15	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PD8	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PD9	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	
	PD11	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PD12	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PD13	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PD14	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PD15	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PG2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PG3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PG4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PG5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PG6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PG7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PG8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PC6	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PC7	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PC8	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PC9	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PA8	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PA11	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PA12	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PA15	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PC10	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PC11	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PC12	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PD0	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PD1	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PD2	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PD3	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PD4	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PD5	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PD6	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PD7	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PG9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PG10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PG11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PG12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PG13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PG14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PG15	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PB3	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PB4	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PB5	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PB6	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PB7	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PB8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	SCL_24C02
	PB9	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	SDA_24C02
	PE0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PE1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	

8.2. DMA configuration

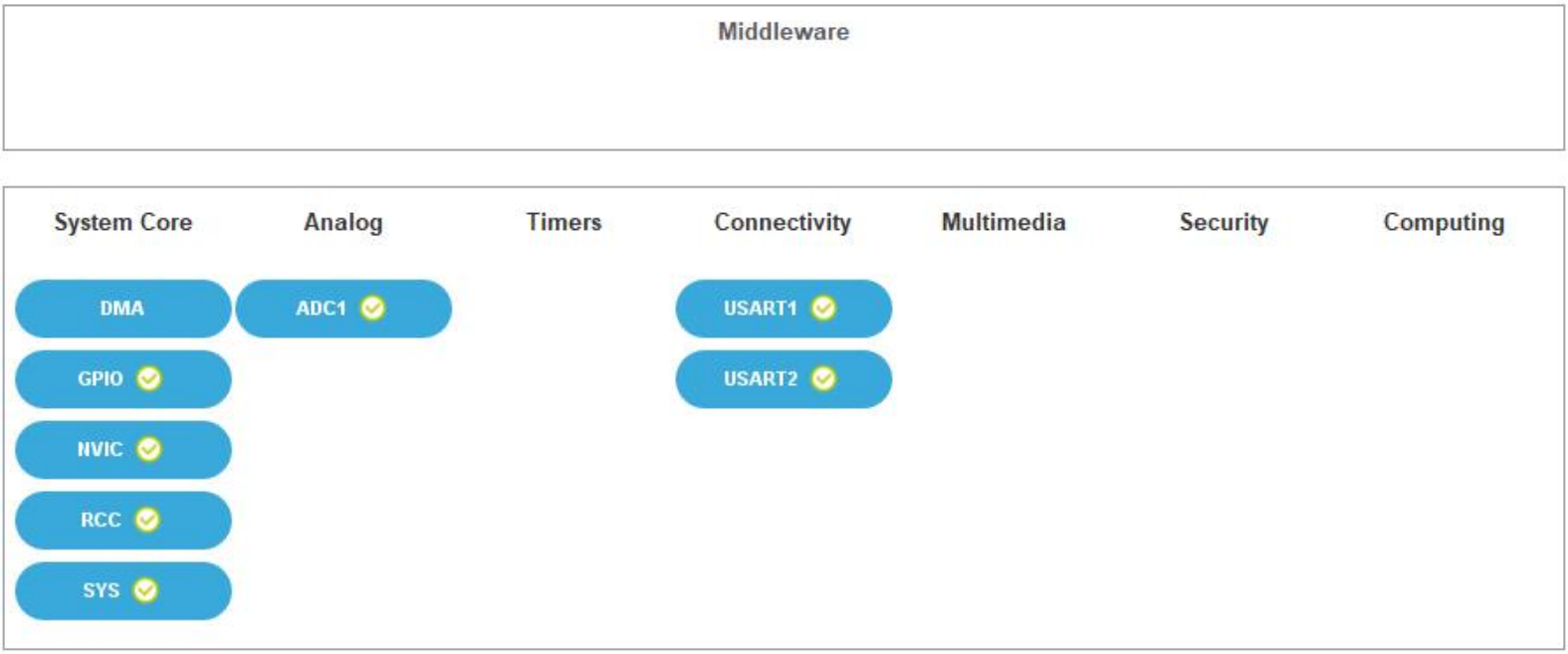
nothing configured in DMA service

8.3. 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	0	0
System tick timer	true	0	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
ADC1, ADC2 and ADC3 global interrupts	unused		
USART1 global interrupt	unused		
USART2 global interrupt	unused		
FPU global interrupt	unused		

*** User modified value**

9. Predefined Views - Category view : Current



10. Software Pack Report