1. Description

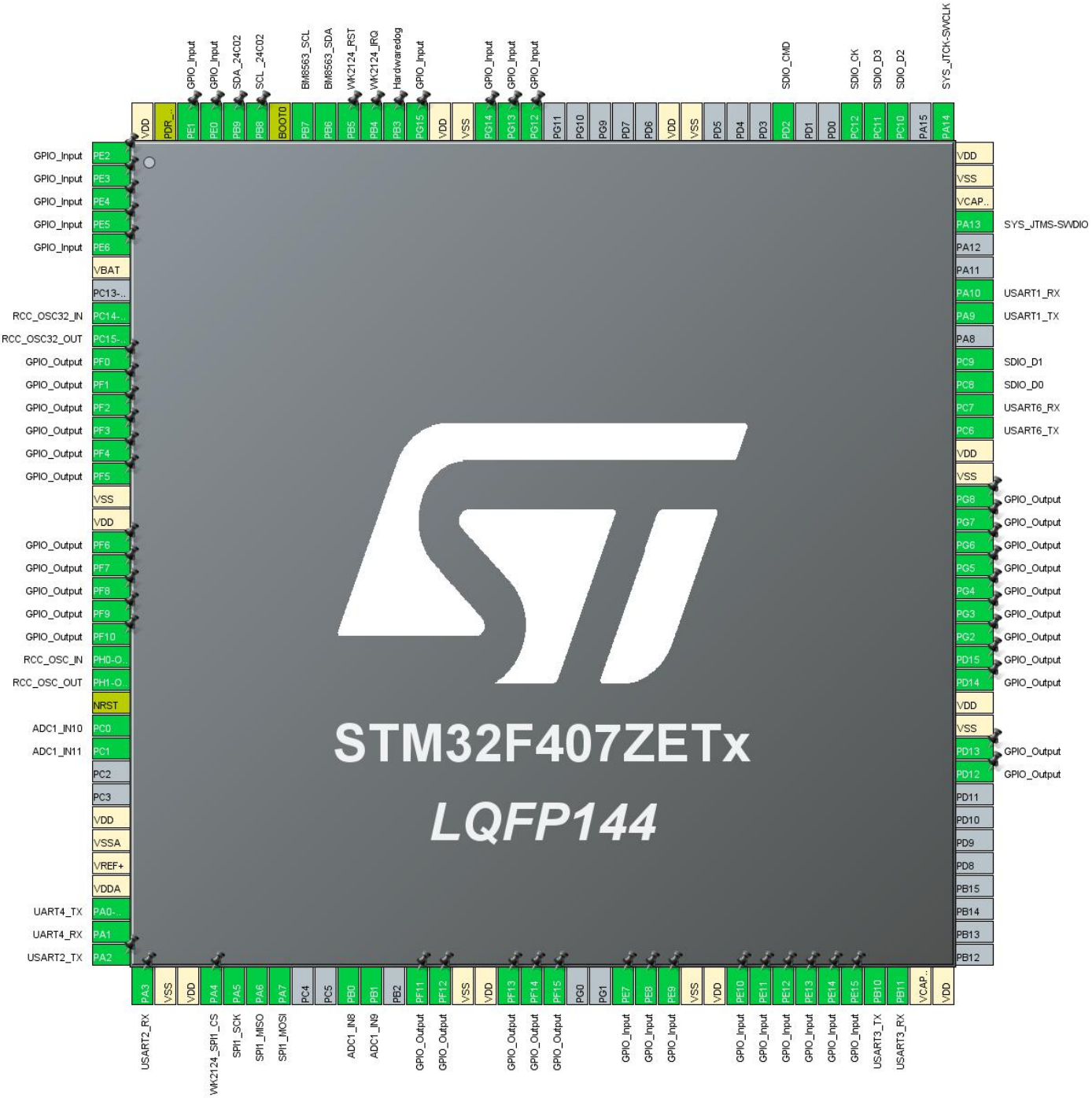
1.1. Project

Project Name	code
Board Name	custom
Generated with:	STM32CubeMX 5.6.1
Date	04/13/2022

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

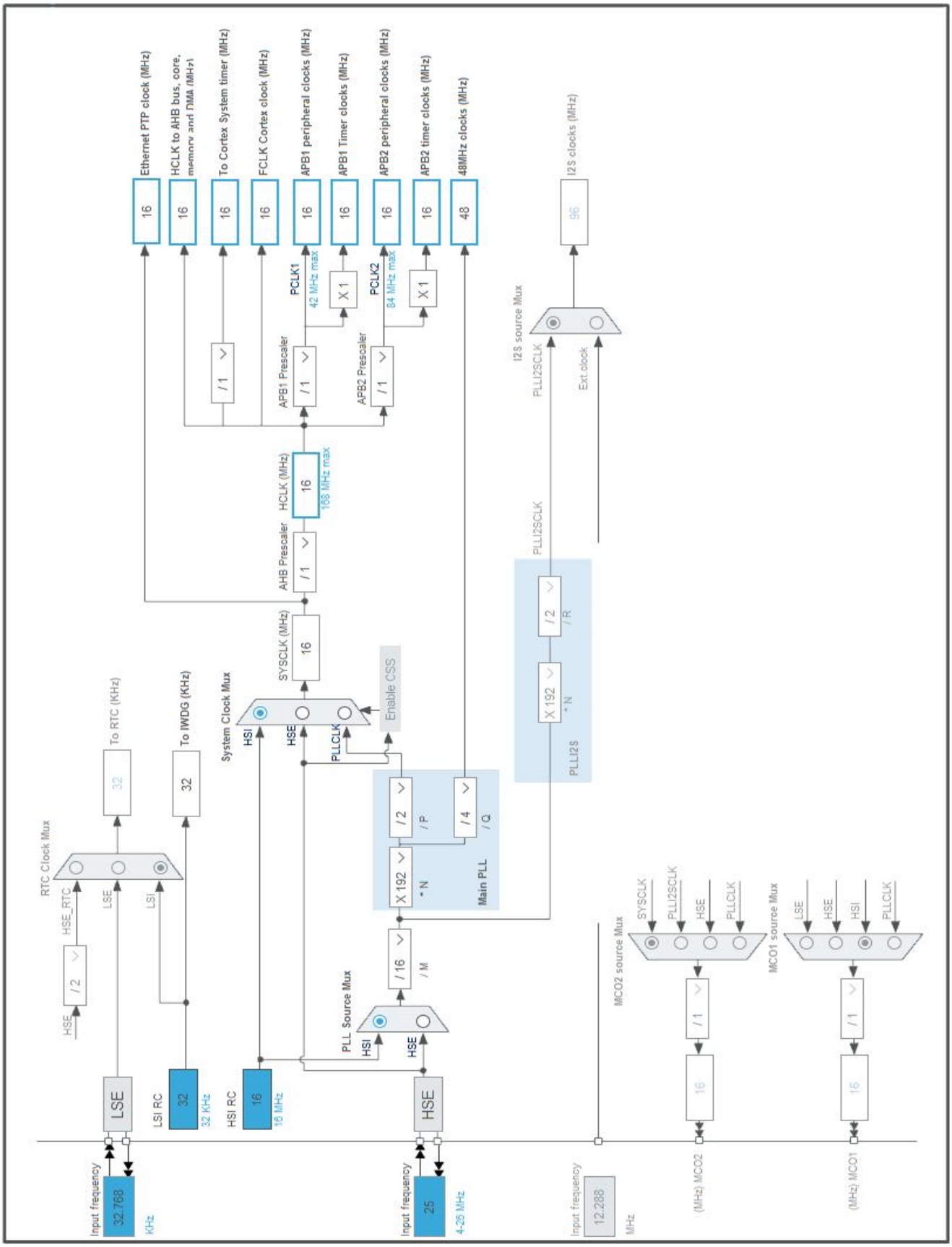
Pin Number LQFP144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	PE2 *	I/O	GPIO_Input	
2	PE3 *	I/O	GPIO_Input	
3	PE4 *	I/O	GPIO_Input	
4	PE5 *	I/O	GPIO_Input	
5	PE6 *	I/O	GPIO_Input	
6	VBAT	Power		
8	PC14-OSC32_IN	I/O	RCC_OSC32_IN	
9	PC15-OSC32_OUT	I/O	RCC_OSC32_OUT	
10	PF0 *	I/O	GPIO_Output	
11	PF1 *	I/O	GPIO_Output	
12	PF2 *	I/O	GPIO_Output	
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	ADC1_IN10	
27	PC1	I/O	ADC1_IN11	
30	VDD	Power		
31	VSSA	Power		
32	VREF+	Power		
33	VDDA	Power		
34	PA0-WKUP	I/O	UART4_TX	
35	PA1	I/O	UART4_RX	
36	PA2	I/O	USART2_TX	
37	PA3	I/O	USART2_RX	
38	VSS	Power		
39	VDD	Power		

Pin Number LQFP144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
40	PA4	I/O	SPI1_NSS	WK2124_SPI1_CS
41	PA5	I/O	SPI1_SCK	
42	PA6	I/O	SPI1_MISO	
43	PA7	I/O	SPI1_MOSI	
46	PB0	I/O	ADC1_IN8	
47	PB1	I/O	ADC1_IN9	
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	
58	PE7 *	I/O	GPIO_Input	
59	PE8 *	I/O	GPIO_Input	
60	PE9 *	I/O	GPIO_Input	
61	VSS	Power		
62	VDD	Power		
63	PE10 *	I/O	GPIO_Input	
64	PE11 *	I/O	GPIO_Input	
65	PE12 *	I/O	GPIO_Input	
66	PE13 *	I/O	GPIO_Input	
67	PE14 *	I/O	GPIO_Input	
68	PE15 *	I/O	GPIO_Input	
69	PB10	I/O	USART3_TX	
70	PB11	I/O	USART3_RX	
71	VCAP_1	Power		
72	VDD	Power		
81	PD12 *	I/O	GPIO_Output	
82	PD13 *	I/O	GPIO_Output	
83	VSS	Power		
84	VDD	Power		
85	PD14 *	I/O	GPIO_Output	
86	PD15 *	I/O	GPIO_Output	
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	

Pin Number LQFP144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
92	PG7 *	I/O	GPIO_Output	
93	PG8 *	I/O	GPIO_Output	
94	VSS	Power		
95	VDD	Power		
96	PC6	I/O	USART6_TX	
97	PC7	I/O	USART6_RX	
98	PC8	I/O	SDIO_D0	
99	PC9	I/O	SDIO_D1	
101	PA9	I/O	USART1_TX	
102	PA10	I/O	USART1_RX	
105	PA13	I/O	SYS_JTMS-SWDIO	
106	VCAP_2	Power		
107	VSS	Power		
108	VDD	Power		
109	PA14	I/O	SYS_JTCK-SWCLK	
111	PC10	I/O	SDIO_D2	
112	PC11	I/O	SDIO_D3	
113	PC12	I/O	SDIO_CK	
116	PD2	I/O	SDIO_CMD	
120	VSS	Power		
121	VDD	Power		
127	PG12 *	I/O	GPIO_Input	
128	PG13 *	I/O	GPIO_Input	
129	PG14 *	I/O	GPIO_Input	
130	VSS	Power		
131	VDD	Power		
132	PG15 *	I/O	GPIO_Input	
133	PB3 *	I/O	GPIO_Output	Hardwaredog
134	PB4 *	I/O	GPIO_Output	WK2124_IRQ
135	PB5 *	I/O	GPIO_Input	WK2124_RST
136	PB6	I/O	I2C1_SCL	BM8563_SDA
137	PB7	I/O	I2C1_SDA	BM8563_SCL
138	BOOT0	Boot		
139	PB8 *	I/O	GPIO_Output	SCL _24C02
140	PB9 *	I/O	GPIO_Input	SDA_24C02
141	PE0 *	I/O	GPIO_Input	
142	PE1 *	I/O	GPIO_Input	
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	code
Project Folder	E:\HP\3 project\6 PLCtoARM\code
Toolchain / IDE	MDK-ARM V5.27
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	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

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

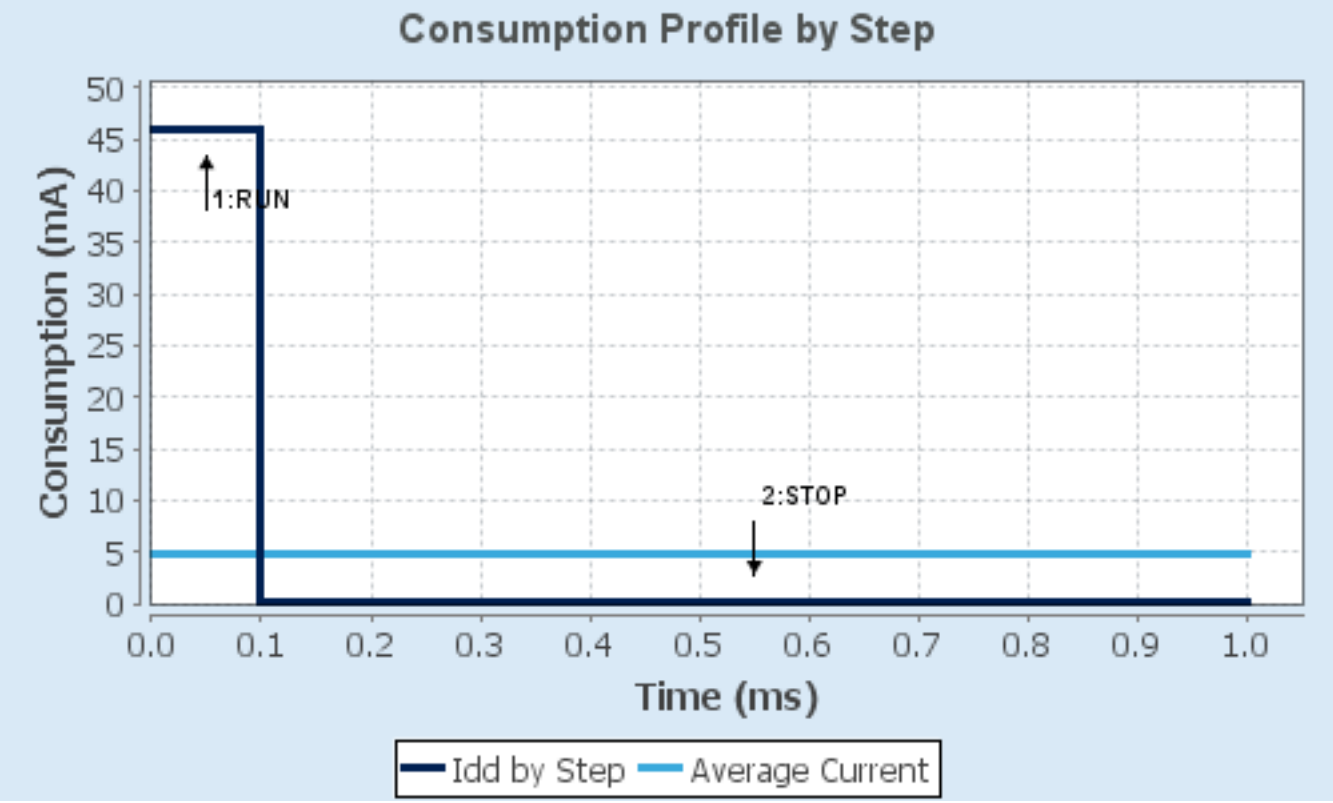
6.4. Sequence

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: IN8

mode: IN9

mode: IN10

mode: IN11

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 8
Sampling Time	3 Cycles

ADC_Injected_ConversionMode:

Number Of Conversions	0

WatchDog:

Enable Analog WatchDog Mode	false

7.2. GPIO

7.3. I2C1

I2C: SMBus-two-wire-Interface

7.3.1. Parameter Settings:

SMBus Slave Features:

Primary Address Length selection	7-bit
Dual Address Acknowledged	Disabled
General Call Address Detection	Disabled
Clock No Stretch Mode	Disabled

SMBus Features:

Packet Error Check Mode	PEC Disabled
Peripheral Mode	Peripheral Mode Smbus Slave

Timeout configuration:

Timeout	0x00008019

7.4. IWDG

mode: Activated

7.4.1. Parameter Settings:

Clocking:

IWDG counter clock prescaler	**32 ***
IWDG down-counter reload value	4095

7.5. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

Low Speed Clock (LSE) : Crystal/Ceramic Resonator

7.5.1. 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

7.6. SDIO

Mode: SD 4 bits Wide bus

7.6.1. 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

7.7. SPI1

Mode: Full-Duplex Master

Hardware NSS Signal: Hardware NSS Output Signal

7.7.1. Parameter Settings:

Basic Parameters:

Frame Format	Motorola
Data Size	8 Bits
First Bit	MSB First

Clock Parameters:

Prescaler (for Baud Rate)	2
Baud Rate	**8.0 MBits/s ***
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Output Hardware

7.8. SYS

Debug: Serial Wire

Timebase Source: SysTick

7.9. UART4

Mode: Asynchronous

7.9.1. 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

7.10. USART1

Mode: Asynchronous

7.10.1. 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

7.11. USART2

Mode: Asynchronous

7.11.1. 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

7.12. USART3

Mode: Asynchronous

7.12.1. 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

7.13. USART6

Mode: Asynchronous

7.13.1. 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

*** 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	PC0	ADC1_IN10	Analog mode	No pull-up and no pull-down	n/a	
	PC1	ADC1_IN11	Analog mode	No pull-up and no pull-down	n/a	
	PB0	ADC1_IN8	Analog mode	No pull-up and no pull-down	n/a	
	PB1	ADC1_IN9	Analog mode	No pull-up and no pull-down	n/a	
I2C1	PB6	I2C1_SCL	Alternate Function Open Drain	Pull-up	**Very High ***	BM8563_SDA
	PB7	I2C1_SDA	Alternate Function Open Drain	Pull-up	**Very High ***	BM8563_SCL
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	
	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	PC8	SDIO_D0	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	
	PC10	SDIO_D2	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	
	PC12	SDIO_CK	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	
SPI1	PA4	SPI1_NSS	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	WK2124_SPI1_CS
	PA5	SPI1_SCK	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	
	PA6	SPI1_MISO	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	
	PA7	SPI1_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
UART4	PA0-WKUP	UART4_TX	Alternate Function Push Pull	Pull-up	**Very High**	

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
					*	
	PA1	UART4_RX	Alternate Function Push Pull	Pull-up	**Very High** *	
USART1	PA9	USART1_TX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High** *	
	PA10	USART1_RX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High** *	
USART2	PA2	USART2_TX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High** *	
	PA3	USART2_RX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High** *	
USART3	PB10	USART3_TX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High** *	
	PB11	USART3_RX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High** *	
USART6	PC6	USART6_TX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High** *	
	PC7	USART6_RX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High** *	
GPIO	PE2	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PE3	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PE4	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PE5	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PE6	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PF0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PF1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PF2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PF3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	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	
	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	

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	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	
	PE7	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PE8	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PE9	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PE10	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PE11	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PE12	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PE13	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PE14	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PE15	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PD12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PD13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PD14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PD15	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	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	
	PG12	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PG13	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PG14	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PG15	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
	PB3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	Hardwaredog
	PB4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	WK2124_IRQ
	PB5	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	WK2124_RST
	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_Input	Input mode	No pull-up and no pull-down	n/a	
	PE1	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	

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		
I2C1 event interrupt	unused		
I2C1 error interrupt	unused		
SPI1 global interrupt	unused		
USART1 global interrupt	unused		
USART2 global interrupt	unused		
USART3 global interrupt	unused		
SDIO global interrupt	unused		
UART4 global interrupt	unused		
USART6 global interrupt	unused		
FPU global interrupt	unused		

*** User modified value**

9. Predefined Views - Category view : Current

10. Software Pack Report