
STM32
CubeMX

1. Description

1.1. Project

Project Name	MIO168 r3B1
Board Name	custom
Generated with:	STM32CubeMX 6.10.0
Date	01/19/2024

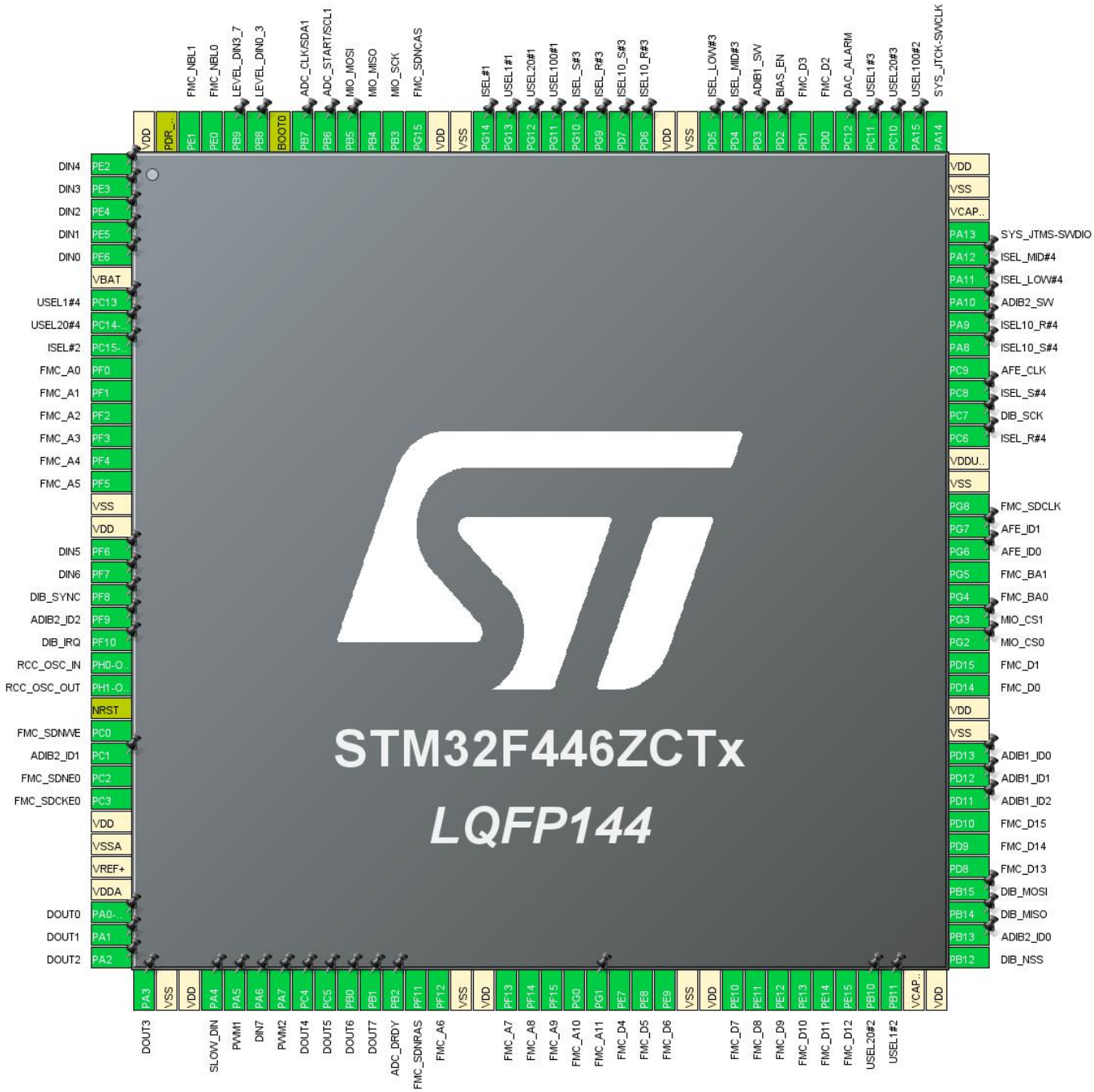
1.2. MCU

MCU Series	STM32F4
MCU Line	STM32F446
MCU name	STM32F446ZCTx
MCU Package	LQFP144
MCU Pin number	144

1.3. Core(s) information

Core(s)	Arm Cortex-M4

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	DIN4
2	PE3 *	I/O	GPIO_Input	DIN3
3	PE4 *	I/O	GPIO_Input	DIN2
4	PE5	I/O	TIM9_CH1	DIN1
5	PE6	I/O	TIM9_CH2	DIN0
6	VBAT	Power		
7	PC13 *	I/O	GPIO_Output	USEL1#4
8	PC14-OSC32_IN *	I/O	GPIO_Output	USEL20#4
9	PC15-OSC32_OUT *	I/O	GPIO_Output	ISEL#2
10	PF0	I/O	FMC_A0	
11	PF1	I/O	FMC_A1	
12	PF2	I/O	FMC_A2	
13	PF3	I/O	FMC_A3	
14	PF4	I/O	FMC_A4	
15	PF5	I/O	FMC_A5	
16	VSS	Power		
17	VDD	Power		
18	PF6 *	I/O	GPIO_Input	DIN5
19	PF7 *	I/O	GPIO_Input	DIN6
20	PF8 *	I/O	GPIO_Input	DIB_SYNC
21	PF9 *	I/O	GPIO_Input	ADIB2_ID2
22	PF10 *	I/O	GPIO_Output	DIB_IRQ
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	FMC_SDNWE	
27	PC1 *	I/O	GPIO_Input	ADIB2_ID1
28	PC2	I/O	FMC_SDNE0	
29	PC3	I/O	FMC_SDCKE0	
30	VDD	Power		
31	VSSA	Power		
32	VREF+	Power		
33	VDDA	Power		
34	PA0-WKUP *	I/O	GPIO_Output	DOUT0
35	PA1 *	I/O	GPIO_Output	DOUT1
36	PA2 *	I/O	GPIO_Output	DOUT2

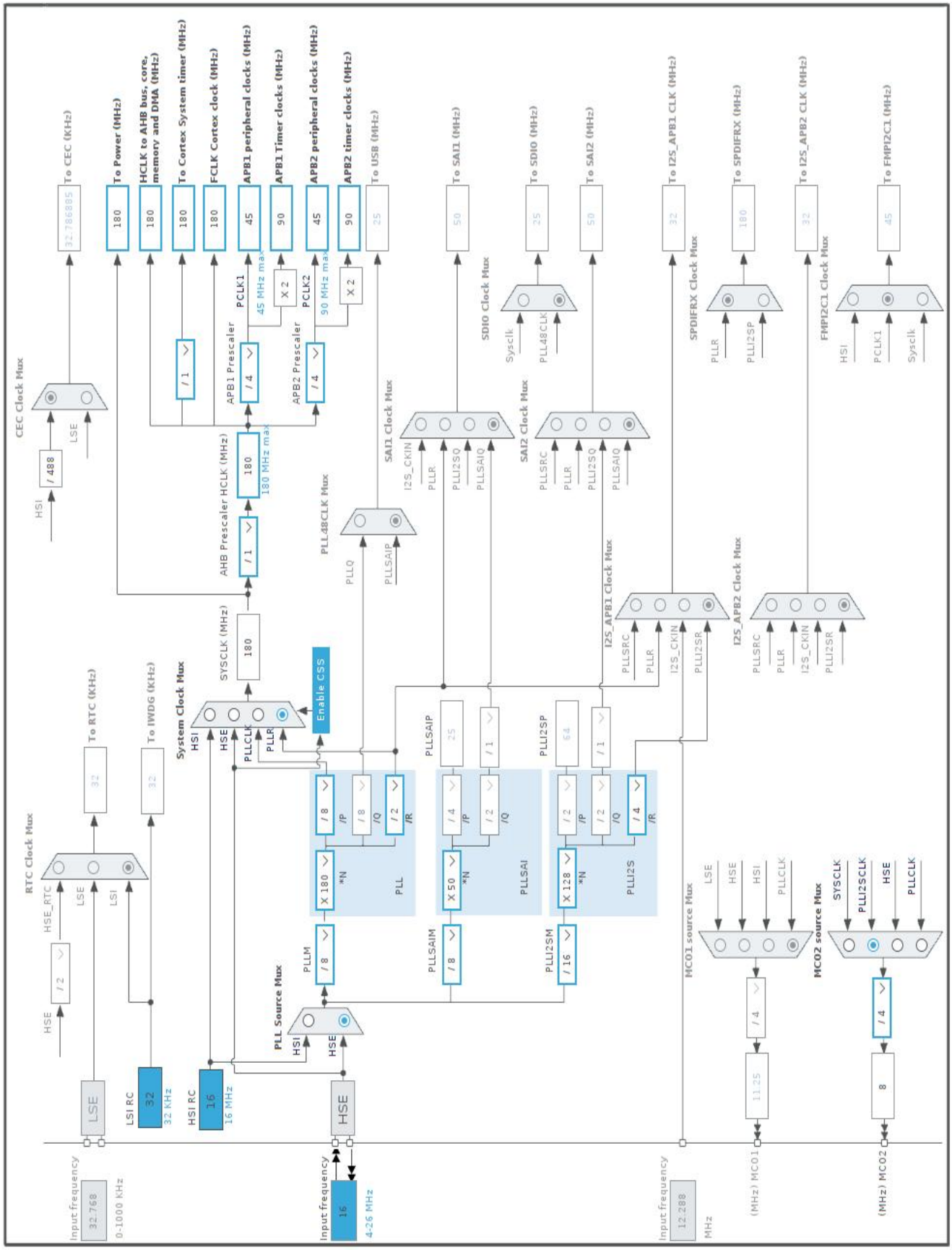
Pin Number LQFP144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
37	PA3 *	I/O	GPIO_Output	DOUT3
38	VSS	Power		
39	VDD	Power		
40	PA4 *	I/O	GPIO_Output	SLOW_DIN
41	PA5	I/O	TIM2_CH1	PWM1
42	PA6 *	I/O	GPIO_Input	DIN7
43	PA7	I/O	TIM3_CH2	PWM2
44	PC4 *	I/O	GPIO_Output	DOUT4
45	PC5 *	I/O	GPIO_Output	DOUT5
46	PB0 *	I/O	GPIO_Output	DOUT6
47	PB1 *	I/O	GPIO_Output	DOUT7
48	PB2 *	I/O	GPIO_Input	ADC_DRDY
49	PF11	I/O	FMC_SDNRAS	
50	PF12	I/O	FMC_A6	
51	VSS	Power		
52	VDD	Power		
53	PF13	I/O	FMC_A7	
54	PF14	I/O	FMC_A8	
55	PF15	I/O	FMC_A9	
56	PG0	I/O	FMC_A10	
57	PG1	I/O	FMC_A11	
58	PE7	I/O	FMC_D4	
59	PE8	I/O	FMC_D5	
60	PE9	I/O	FMC_D6	
61	VSS	Power		
62	VDD	Power		
63	PE10	I/O	FMC_D7	
64	PE11	I/O	FMC_D8	
65	PE12	I/O	FMC_D9	
66	PE13	I/O	FMC_D10	
67	PE14	I/O	FMC_D11	
68	PE15	I/O	FMC_D12	
69	PB10 *	I/O	GPIO_Output	USEL20#2
70	PB11 *	I/O	GPIO_Output	USEL1#2
71	VCAP_1	Power		
72	VDD	Power		
73	PB12	I/O	SPI2_NSS	DIB_NSS
74	PB13 *	I/O	GPIO_Input	ADIB2_ID0
75	PB14	I/O	SPI2_MISO	DIB_MISO

Pin Number LQFP144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
76	PB15	I/O	SPI2_MOSI	DIB_MOSI
77	PD8	I/O	FMC_D13	
78	PD9	I/O	FMC_D14	
79	PD10	I/O	FMC_D15	
80	PD11 *	I/O	GPIO_Input	ADIB1_ID2
81	PD12 *	I/O	GPIO_Input	ADIB1_ID1
82	PD13 *	I/O	GPIO_Input	ADIB1_ID0
83	VSS	Power		
84	VDD	Power		
85	PD14	I/O	FMC_D0	
86	PD15	I/O	FMC_D1	
87	PG2 *	I/O	GPIO_Output	MIO_CS0
88	PG3 *	I/O	GPIO_Output	MIO_CS1
89	PG4	I/O	FMC_BA0	
90	PG5	I/O	FMC_BA1	
91	PG6 *	I/O	GPIO_Input	AFE_ID0
92	PG7 *	I/O	GPIO_Input	AFE_ID1
93	PG8	I/O	FMC_SDCLK	
94	VSS	Power		
95	VDDUSB	Power		
96	PC6 *	I/O	GPIO_Output	ISEL_R#4
97	PC7	I/O	SPI2_SCK	DIB_SCK
98	PC8 *	I/O	GPIO_Output	ISEL_S#4
99	PC9	I/O	RCC_MCO_2	AFE_CLK
100	PA8 *	I/O	GPIO_Output	ISEL10_S#4
101	PA9 *	I/O	GPIO_Output	ISEL10_R#4
102	PA10 *	I/O	GPIO_Output	ADIB2_SW
103	PA11 *	I/O	GPIO_Output	ISEL_LOW#4
104	PA12 *	I/O	GPIO_Output	ISEL_MID#4
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_Output	USEL100#2
111	PC10 *	I/O	GPIO_Output	USEL20#3
112	PC11 *	I/O	GPIO_Output	USEL1#3
113	PC12 *	I/O	GPIO_Input	DAC_ALARM
114	PD0	I/O	FMC_D2	

Pin Number LQFP144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
115	PD1	I/O	FMC_D3	
116	PD2 *	I/O	GPIO_Output	BIAS_EN
117	PD3 *	I/O	GPIO_Output	ADIB1_SW
118	PD4 *	I/O	GPIO_Output	ISEL_MID#3
119	PD5 *	I/O	GPIO_Output	ISEL_LOW#3
120	VSS	Power		
121	VDD	Power		
122	PD6 *	I/O	GPIO_Output	ISEL10_R#3
123	PD7 *	I/O	GPIO_Output	ISEL10_S#3
124	PG9 *	I/O	GPIO_Output	ISEL_R#3
125	PG10 *	I/O	GPIO_Output	ISEL_S#3
126	PG11 *	I/O	GPIO_Output	USEL100#1
127	PG12 *	I/O	GPIO_Output	USEL20#1
128	PG13 *	I/O	GPIO_Output	USEL1#1
129	PG14 *	I/O	GPIO_Output	ISEL#1
130	VSS	Power		
131	VDD	Power		
132	PG15	I/O	FMC_SDNCAS	
133	PB3	I/O	SPI3_SCK	MIO_SCK
134	PB4	I/O	SPI3_MISO	MIO_MISO
135	PB5	I/O	SPI3_MOSI	MIO_MOSI
136	PB6 *	I/O	GPIO_Output	ADC_START/SCL1
137	PB7 *	I/O	GPIO_Output	ADC_CLK/SDA1
138	BOOT0	Boot		
139	PB8 *	I/O	GPIO_Output	LEVEL_DIN0_3
140	PB9 *	I/O	GPIO_Output	LEVEL_DIN3_7
141	PE0	I/O	FMC_NBL0	
142	PE1	I/O	FMC_NBL1	
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	MIO168 r3B1
Project Folder	/home/denis/git-public/dib-mio168/CubeMX
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_F4 V1.26.1
Application Structure	Advanced
Generate Under Root	Yes
Do not generate the main()	No
Minimum Heap Size	0x2000
Minimum Stack Size	0x4000

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	No
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)	No
Enable Full Assert	No

5.3. Advanced Settings - Generated Function Calls

Rank	Function Name	Peripheral Instance Name
1	MX_GPIO_Init	GPIO
2	MX_DMA_Init	DMA
3	SystemClock_Config	RCC
4	MX_CRC_Init	CRC
5	MX_SPI2_Init	SPI2
6	MX_SPI3_Init	SPI3
7	MX_TIM9_Init	TIM9
8	MX_TIM6_Init	TIM6
9	MX_TIM2_Init	TIM2
10	MX_TIM3_Init	TIM3
11	MX_TIM7_Init	TIM7

Rank	Function Name	Peripheral Instance Name
12	MX_FMC_Init	FMC

1. Power Consumption Calculator report

1.1. Microcontroller Selection

Series	STM32F4
Line	STM32F446
MCU	STM32F446ZCTx
Datasheet	DS10693_Rev6

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

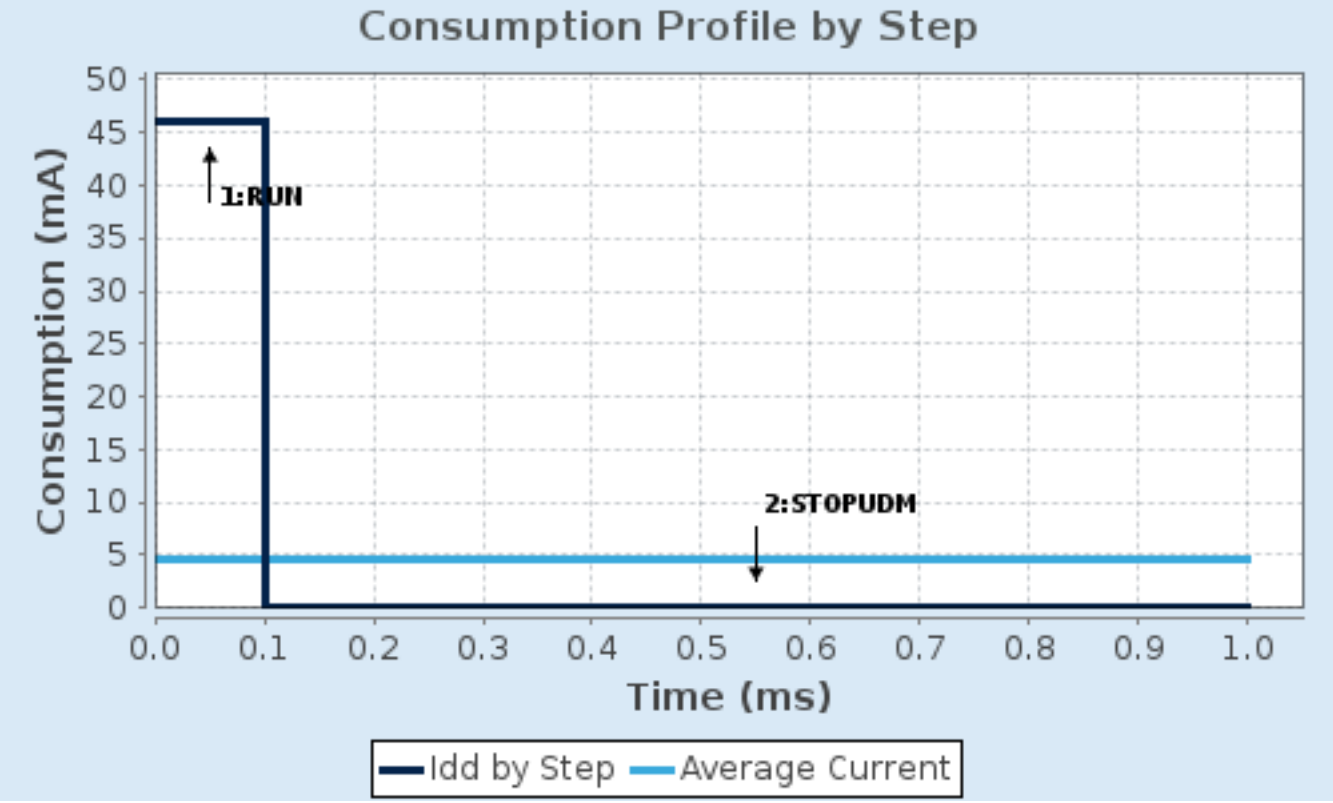
1.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP_UDM (Under Drive)
Vdd	3.3	3.3
Voltage Source	Battery	Battery
Range	Scale1-High	No Scale
Fetch Type	RAM/FLASH/REGON/ART/PREFETCH	n/a
CPU Frequency	180 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	55 µA
Duration	0.1 ms	0.9 ms
DMIPS	225.0	0.0
Ta Max	99.99	104.99
Category	In DS Table	In DS Table

1.5. Results

Sequence Time	1 ms	Average Current	4.65 mA
Battery Life	1 month	Average DMIPS	225.0 DMIPS

1.6. Chart


Consumption Profile by Step
Consumption (mA)
50
45
40
35
30
25
20
15
10
5
0
1:RUN
2:STOPUDM
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

2. Peripherals and Middlewares Configuration

2.1. CRC

mode: Activated

2.2. FMC

SDRAM 1

Clock and chip enable: SDCKE0+SDNE0

Internal bank number: 4 banks

Address: 12 bits

Data: 16 bits

Byte enable: set

2.2.1. SDRAM 1:

SDRAM control:

Bank	SDRAM bank 1
Number of column address bits	8 bits
Number of row address bits	12 bits
CAS latency	1 memory clock cycle
Write protection	Disabled
SDRAM common clock	Disabled
SDRAM common burst read	Disabled
SDRAM common read pipe delay	0 HCLK clock cycle

SDRAM timing in memory clock cycles:

Load mode register to active delay	16
Exit self-refresh delay	16
Self-refresh time	16
SDRAM common row cycle delay	16
Write recovery time	16
SDRAM common row precharge delay	16
Row to column delay	16

2.3. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

mode: Master Clock Output 2

2.3.1. 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 Timout Value (ms)	100
LSE Startup Timout Value (ms)	5000

Power Parameters:

Power Regulator Voltage Scale	Power Regulator Voltage Scale 1
Power Over Drive	Enabled

2.4. SPI2

Mode: Full-Duplex Slave

Hardware NSS Signal: Hardware NSS Input Signal

2.4.1. Parameter Settings:

Basic Parameters:

Frame Format	Motorola
Data Size	8 Bits
First Bit	MSB First

Clock Parameters:

Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Input Hardware

2.5. SPI3

Mode: Full-Duplex Master

2.5.1. Parameter Settings:

Basic Parameters:

Frame Format	Motorola
Data Size	8 Bits

First Bit	MSB First

Clock Parameters:

Prescaler (for Baud Rate)	2
Baud Rate	**22.5 MBits/s ***
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	**2 Edge ***

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

2.6. SYS

Debug: Serial Wire

Timebase Source: SysTick

2.7. TIM2

Channel1: PWM Generation CH1

2.7.1. 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
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 1:

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

2.8. TIM3

Channel2: PWM Generation CH2

2.8.1. 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
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. TIM6

mode: Activated

2.9.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**8 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**999 ***
auto-reload preload	**Enable ***

Trigger Output (TRGO) Parameters:

Trigger Event Selection	Reset (UG bit from TIMx_EGR)

2.10. TIM7

mode: Activated

2.10.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**8 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**999 ***
auto-reload preload	**Enable ***

Trigger Output (TRGO) Parameters:

Trigger Event Selection	Reset (UG bit from TIMx_EGR)

2.11. TIM9

Channel1: Input Capture direct mode

Channel2: Input Capture direct mode

2.11.1. 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
auto-reload preload	Disable

Input Capture Channel 1:

Polarity Selection	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter (4 bits value)	0

Input Capture Channel 2:

Polarity Selection	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter (4 bits value)	0

*** User modified value**

3. System Configuration

3.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
FMC	PF0	FMC_A0	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PF1	FMC_A1	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PF2	FMC_A2	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PF3	FMC_A3	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PF4	FMC_A4	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PF5	FMC_A5	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PC0	FMC_SDNWE	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PC2	FMC_SDNE0	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PC3	FMC_SDCKE0	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PF11	FMC_SDNRAS	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PF12	FMC_A6	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PF13	FMC_A7	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PF14	FMC_A8	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PF15	FMC_A9	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PG0	FMC_A10	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PG1	FMC_A11	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PE7	FMC_D4	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PE8	FMC_D5	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PE9	FMC_D6	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PE10	FMC_D7	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PE11	FMC_D8	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PE12	FMC_D9	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PE13	FMC_D10	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PE14	FMC_D11	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PE15	FMC_D12	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PD8	FMC_D13	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PD9	FMC_D14	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PD10	FMC_D15	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PD14	FMC_D0	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PD15	FMC_D1	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PG4	FMC_BA0	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PG5	FMC_BA1	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PG8	FMC_SDCLK	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PD0	FMC_D2	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PD1	FMC_D3	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PG15	FMC_SDNCAS	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
	PE0	FMC_NBL0	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PE1	FMC_NBL1	Alternate Function Push Pull	No pull-up and no pull-down	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	
	PC9	RCC_MCO_2	Alternate Function Push Pull	No pull-up and no pull-down	Low	AFE_CLK
SPI2	PB12	SPI2_NSS	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	DIB_NSS
	PB14	SPI2_MISO	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	DIB_MISO
	PB15	SPI2_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	DIB_MOSI
	PC7	SPI2_SCK	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	DIB_SCK
SPI3	PB3	SPI3_SCK	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	MIO_SCK
	PB4	SPI3_MISO	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	MIO_MISO
	PB5	SPI3_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	MIO_MOSI
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
TIM2	PA5	TIM2_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	PWM1
TIM3	PA7	TIM3_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	PWM2
TIM9	PE5	TIM9_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	DIN1
	PE6	TIM9_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	DIN0
GPIO	PE2	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	DIN4
	PE3	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	DIN3
	PE4	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	DIN2
	PC13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	USEL1#4
	PC14-OSC32_IN	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	USEL20#4
	PC15-OSC32_OUT	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ISEL#2
	PF6	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	DIN5
	PF7	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	DIN6

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PF8	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	DIB_SYNC
	PF9	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	ADIB2_ID2
	PF10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DIB_IRQ
	PC1	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	ADIB2_ID1
	PA0-WKUP	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DOUT0
	PA1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DOUT1
	PA2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DOUT2
	PA3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DOUT3
	PA4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	SLOW_DIN
	PA6	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	DIN7
	PC4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DOUT4
	PC5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DOUT5
	PB0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DOUT6
	PB1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DOUT7
	PB2	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	ADC_DRDY
	PB10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	USEL20#2
	PB11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	USEL1#2
	PB13	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	ADIB2_ID0
	PD11	GPIO_Input	Input mode	**Pull-up ***	n/a	ADIB1_ID2
	PD12	GPIO_Input	Input mode	**Pull-up ***	n/a	ADIB1_ID1
	PD13	GPIO_Input	Input mode	**Pull-up ***	n/a	ADIB1_ID0
	PG2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	MIO_CS0
	PG3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	MIO_CS1
	PG6	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	AFE_ID0
	PG7	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	AFE_ID1
	PC6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ISEL_R#4
	PC8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ISEL_S#4
	PA8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ISEL10_S#4
	PA9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ISEL10_R#4
	PA10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ADIB2_SW
	PA11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ISEL_LOW#4
	PA12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ISEL_MID#4
	PA15	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	USEL100#2
	PC10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	USEL20#3
	PC11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	USEL1#3
	PC12	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	DAC_ALARM
	PD2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	BIAS_EN
	PD3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ADIB1_SW
	PD4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ISEL_MID#3
	PD5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ISEL_LOW#3

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PD6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ISEL10_R#3
	PD7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ISEL10_S#3
	PG9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ISEL_R#3
	PG10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ISEL_S#3
	PG11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	USEL100#1
	PG12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	USEL20#1
	PG13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	USEL1#1
	PG14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ISEL#1
	PB6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ADC_START/SCL1
	PB7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ADC_CLK/SDA1
	PB8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LEVEL_DIN0_3
	PB9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LEVEL_DIN3_7

3.2. DMA configuration

DMA request	Stream	Direction	Priority
SPI3_RX	DMA1_Stream0	Peripheral To Memory	Low
SPI3_TX	DMA1_Stream5	Memory To Peripheral	Low

SPI3_RX: DMA1_Stream0 DMA request Settings:

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

SPI3_TX: DMA1_Stream5 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	0	0
System tick timer	true	0	0
DMA1 stream0 global interrupt	true	0	0
DMA1 stream5 global interrupt	true	0	0
TIM6 global interrupt and DAC1, DAC2 underrun error interrupts	true	0	0
TIM7 global interrupt	true	0	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
TIM1 break interrupt and TIM9 global interrupt	unused		
TIM2 global interrupt	unused		
TIM3 global interrupt	unused		
SPI2 global interrupt	unused		
FMC global interrupt	unused		
SPI3 global interrupt	unused		
FPU global interrupt	unused		

3.3.2. NVIC Code generation

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	true	false
Debug monitor	false	true	false
Pendable request for system service	false	true	false
System tick timer	false	true	true

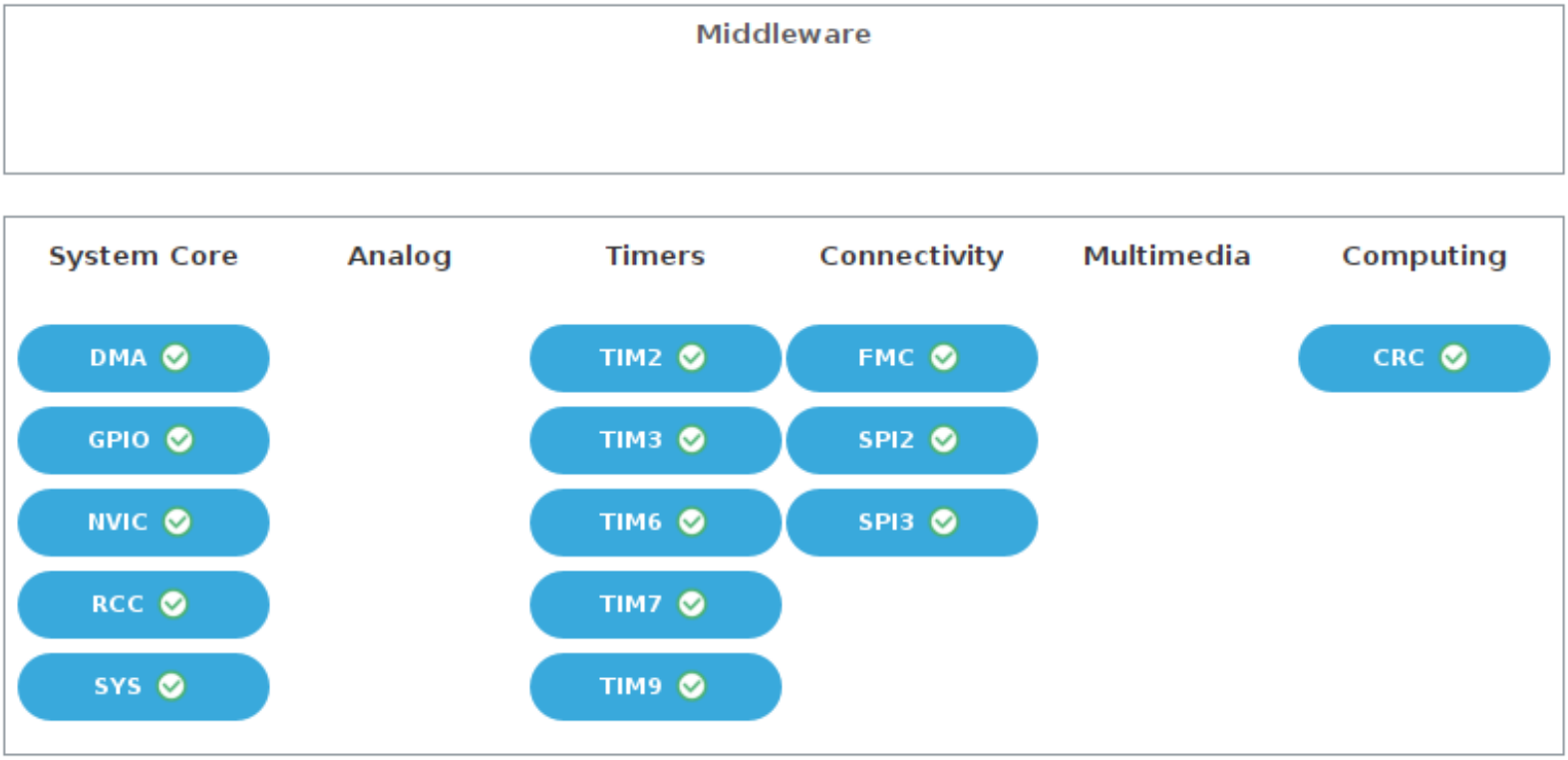
Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
DMA1 stream0 global interrupt	false	true	true
DMA1 stream5 global interrupt	false	true	true
TIM6 global interrupt and DAC1, DAC2 underrun error interrupts	false	true	true
TIM7 global interrupt	false	true	true

*** User modified value**

4. System Views

4.1. Category view

4.1.1. Current



5. Docs & Resources

Type	Link
BSDL files	https://www.st.com/resource/en/bsdl_model/stm32f446_bsdl.zip
IBIS models	https://www.st.com/resource/en/ibis_model/stm32f446_ibis.zip
System View Description	https://www.st.com/resource/en/svd/stm32f4_svd.zip
Presentations	https://www.st.com/resource/en/product_presentation/stm32-stm8_embedded_software_solutions.pdf
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Presentations	https://www.st.com/resource/en/product_presentation/microcontrollers-stm32-family-overview.pdf
Brochures	https://www.st.com/resource/en/brochure/products-and-solutions-for-plcs-and-smart-i-os.pdf
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Product Certifications	https://www.st.com/resource/en/certification_document/stm32_authentication_can.pdf
Application Notes	https://www.st.com/resource/en/application_note/an1181-electrostatic-discharge-sensitivity-measurement-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an1709-emc-design-guide-for-stm8-stm32-and-legacy-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an2606-stm32-microcontroller-system-memory-boot-mode-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an2639-soldering-recommendations-and-package-information-for-leadfree-ecopack-mcus-

	and-mpus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an2867-oscillator-design-guide-for-stm8afals-stm32-mcus-and-mpus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an2945-stm8s-and-stm32-mcus-a-consistent-832bit-product-line-for-painless-migration-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an3070-managing-the-driver-enable-signal-for-rs485-and-iolink-communications-with-the-stm32s-usart-stmicroelectronics.pdf
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Application Notes	https://www.st.com/resource/en/application_note/an3154-can-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an3155-usart-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an3156-usb-dfu-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf
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Application Notes	https://www.st.com/resource/en/application_note/an4031-using-the-stm32f2-stm32f4-and-stm32f7-series-dma-controller-stmicroelectronics.pdf
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Application Notes	https://www.st.com/resource/en/application_note/an4229-how-to-

	implement-a-vocoder-solution-using-stm32-microcontrollers-stmicroelectronics.pdf
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Application Notes	https://www.st.com/resource/en/application_note/an4566-extending-the-dac-performance-of-stm32-microcontrollers-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4640-peripherals-interconnections-on-stm32f4057xx-stm32f4157xx-stm32f42xxx-stm32f43xxx-stm32f446xx-and-stm32f469479xx-stmicroelectronics.pdf
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Application Notes	https://www.st.com/resource/en/application_note/an4803-highspeed-si-simulations-using-ibis-and-boardlevel-simulations-using-hyperlynx-si-on-stm32-mcus-and-mpus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4850-stm32-mcus-

	spreadspectrum-clock-generation-principles-properties-and-implementation-stmicroelectronics.pdf
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for related Tools & Software	and-recording-using-the-stm32f4discovery-stmicroelectronics.pdf
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Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4499-stm32--nrf51822-bluetooth-low-energy-system-solution-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4657-stm32-inapplication-programming-iap-using-the-usart-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4666-parallel-synchronous-transmission-using-gpio-and-dma-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4678-full-duplex-spi-emulation-for-stm32f4-microcontrollers-stmicroelectronics.pdf
Application Notes for related Tools	https://www.st.com/resource/en/application_note/an4701-proprietary-code-readout-protection-on-microcontrollers-of-the-stm32f4-series-

& Software	stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4739-stm32cube-firmware-examples-for-stm32f4-series-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4758-proprietary-code-readout-protection-on-stm32l4-stm32l4-stm32g4-and-stm32wb-series-mcus-stmicroelectronics.pdf
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Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4841-digital-signal-processing-for-stm32-microcontrollers-using-cmsis-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4852-programming-an-external-flash-memory-using-the-uart-bootloader-builtin-stm32-microcontrollers-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4968-proprietary-code-read-out-protection-pcrop-on-stm32f72xxx-and-stm32f73xxx-microcontrollers-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5054-secure-programming-using-stm32cubeprogrammer-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5056-integration-guide-for-the-xcubesbsfu-stm32cube-expansion-package-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5360-getting-started-with-projects-based-on-the-stm32mp1-series-in-stm32cubeide-stmicroelectronics.pdf
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Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5426-migrating-graphics-middleware-projects-from-stm32cubemx-540-to-stm32cubemx-550-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5464-position-control-of-a-threephase-permanent-magnet-motor-using-xcubemcsdk-or-xcubemcsdkful-stmicroelectronics.pdf
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Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5952-how-to-use-cmake-in-stm32cubeide-stmicroelectronics.pdf
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Reference Manuals	https://www.st.com/resource/en/reference_manual/rm0390-stm32f446xx-advanced-armbased-32bit-mcus-stmicroelectronics.pdf
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