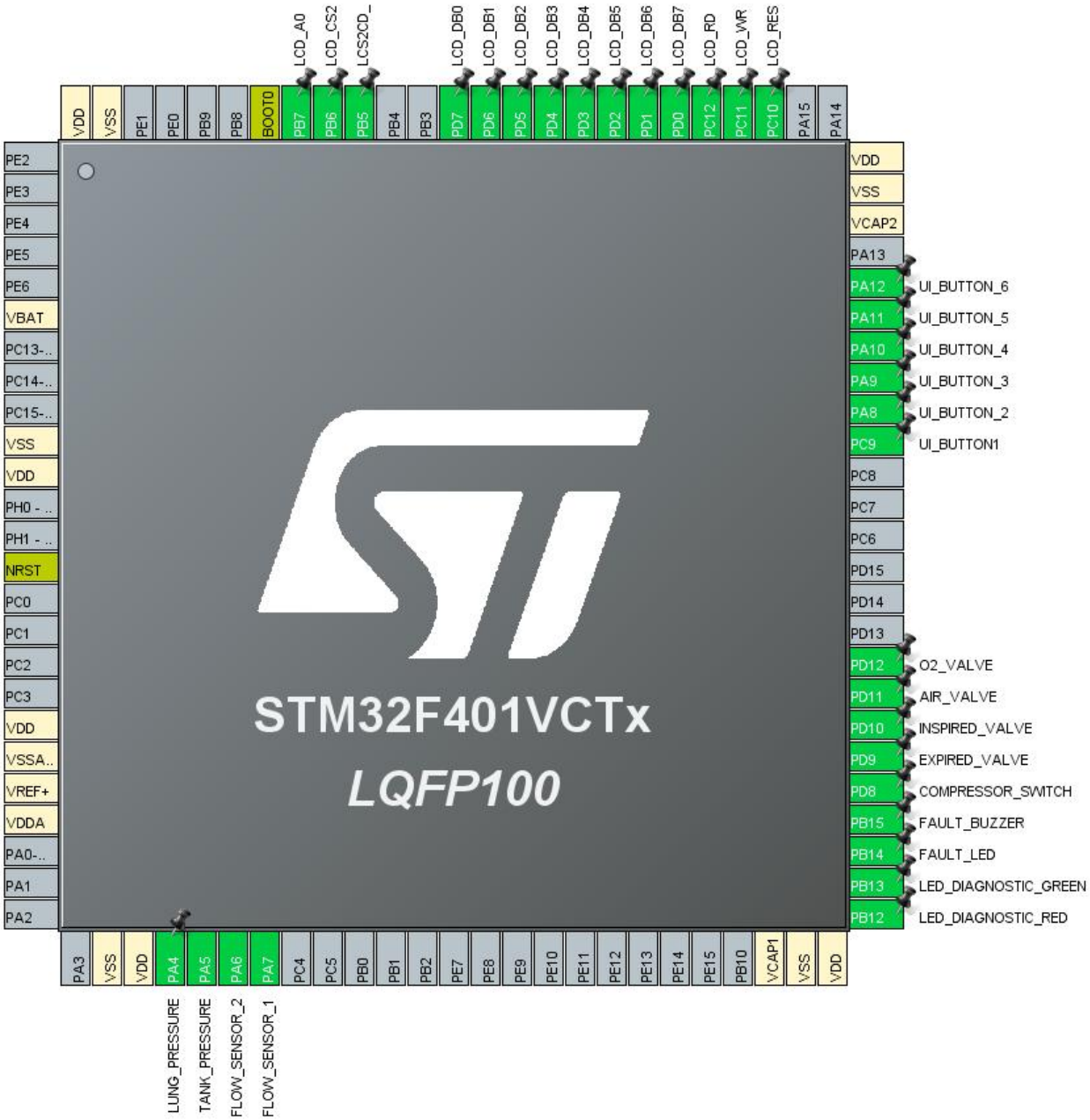
1. Description

1.1. MCU

MCU Series	STM32F4
MCU Line	STM32F401
MCU name	STM32F401VCTx
MCU Package	LQFP100
MCU Pin number	100

Please note that the device's firmware is programmed during production and there is no need for any person to re-program the device. The attached zip file contains the firmware that will be loaded into the chip (MCU) during production.

2. Pinout Configuration



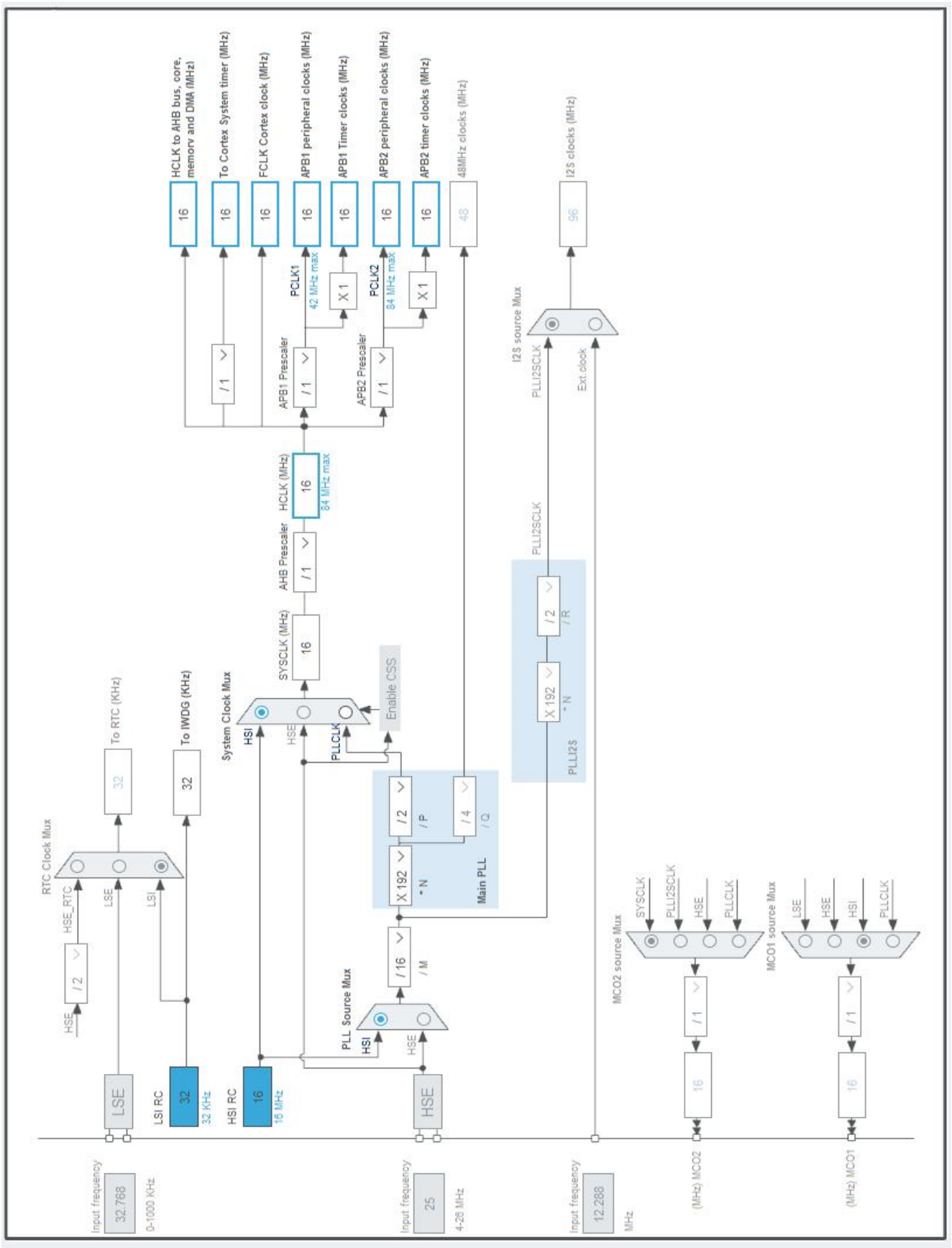
3. Pins Configuration

Pin Number LQFP100	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
6	VBAT	Power		
10	VSS	Power		
11	VDD	Power		
14	NRST	Reset		
19	VDD	Power		
20	VSSA/VREF-	Power		
21	VREF+	Power		
22	VDDA	Power		
27	VSS	Power		
28	VDD	Power		
29	PA4	I/O	ADC1_IN4	LUNG_PRESSURE
30	PA5	I/O	ADC1_IN5	TANK_PRESSURE
31	PA6	I/O	ADC1_IN6	FLOW_SENSOR_2
32	PA7	I/O	ADC1_IN7	FLOW_SENSOR_1
48	VCAP1	Power		
49	VSS	Power		
50	VDD	Power		
51	PB12 *	I/O	GPIO_Output	LED_DIAGNOSTIC_RED
52	PB13 *	I/O	GPIO_Output	LED_DIAGNOSTIC_GREEN
53	PB14 *	I/O	GPIO_Output	FAULT_LED
54	PB15 *	I/O	GPIO_Output	FAULT_BUZZER
55	PD8 *	I/O	GPIO_Output	COMPRESSOR_SWITCH
56	PD9 *	I/O	GPIO_Output	EXPIRED_VALVE
57	PD10 *	I/O	GPIO_Output	INSPIRED_VALVE
58	PD11 *	I/O	GPIO_Output	AIR_VALVE
59	PD12 *	I/O	GPIO_Output	O2_VALVE
66	PC9 *	I/O	GPIO_Input	UI_BUTTON1
67	PA8 *	I/O	GPIO_Input	UI_BUTTON_2
68	PA9 *	I/O	GPIO_Input	UI_BUTTON_3
69	PA10 *	I/O	GPIO_Input	UI_BUTTON_4
70	PA11 *	I/O	GPIO_Input	UI_BUTTON_5
71	PA12 *	I/O	GPIO_Input	UI_BUTTON_6
73	VCAP2	Power		
74	VSS	Power		
75	VDD	Power		

Pin Number LQFP100	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
78	PC10 *	I/O	GPIO_Output	LCD_RES
79	PC11 *	I/O	GPIO_Output	LCD_WR
80	PC12 *	I/O	GPIO_Output	LCD_RD
81	PD0 *	I/O	GPIO_Output	LCD_DB7
82	PD1 *	I/O	GPIO_Output	LCD_DB6
83	PD2 *	I/O	GPIO_Output	LCD_DB5
84	PD3 *	I/O	GPIO_Output	LCD_DB4
85	PD4 *	I/O	GPIO_Output	LCD_DB3
86	PD5 *	I/O	GPIO_Output	LCD_DB2
87	PD6 *	I/O	GPIO_Output	LCD_DB1
88	PD7 *	I/O	GPIO_Output	LCD_DB0
91	PB5 *	I/O	GPIO_Output	LCS2CD_
92	PB6 *	I/O	GPIO_Output	LCD_CS2
93	PB7 *	I/O	GPIO_Output	LCD_A0
94	BOOT0	Boot		
99	VSS	Power		
100	VDD	Power		

* The pin is affected with an I/O function

4. Clock Tree Configuration



5. Software Project

5.1. Project Settings

6. Power Consumption Calculator report

6.1. Microcontroller Selection

Series	STM32F4
Line	STM32F401
MCU	STM32F401VCTx
Datasheet	024738_Rev8

6.2. Parameter Selection

Temperature	25
Vdd	3.3

6.3. Battery Selection

Battery	
Capacity	
Self Discharge	
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

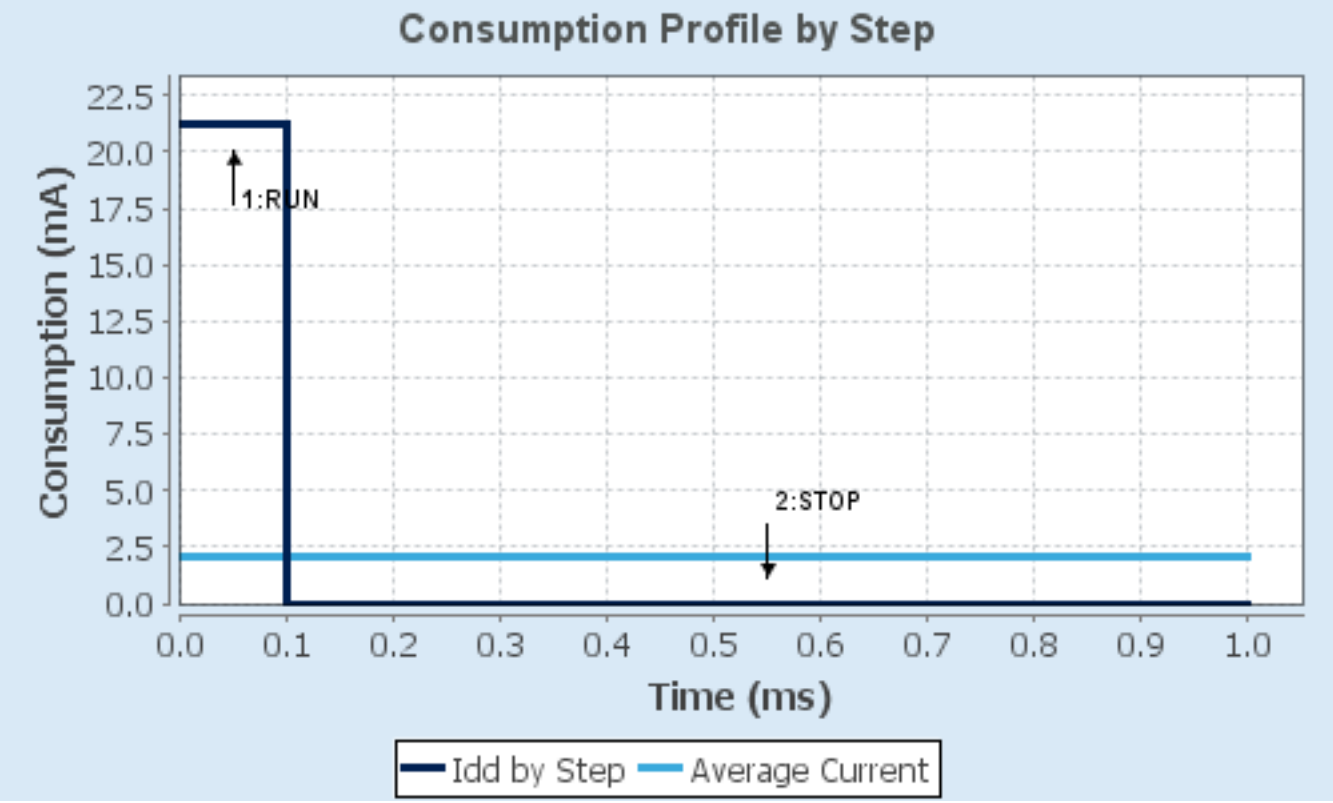
6.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP
Vdd	3.3	3.3
Voltage Source	Battery	Battery
Range	Scale2-Medium	No Scale
Fetch Type	FLASH/ART/PREFETCH	n/a
CPU Frequency	84 MHz	0 Hz
Clock Configuration	HSE PLL	Regulator_LPLV Flash-PwrDwn
Clock Source Frequency	4 MHz	0 Hz
Peripherals		
Additional Cons.	0 mA	0 mA
Average Current	21.2 mA	10 µA
Duration	0.1 ms	0.9 ms
DMIPS	105.0	0.0
Ta Max	102.06	105
Category	In DS Table	In DS Table

6.5. RESULTS

Sequence Time	1 ms	Average Current	2.13 mA
Battery Life	2 months, 5 days, 14 hours	Average DMIPS	105.0 DMIPS

6.6. Chart


Consumption Profile by Step
Consumption (mA)
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
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: Temperature Sensor Channel

7.1.1. Parameter Settings:

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	**Enabled ***
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. IWDG

mode: Activated

7.3.1. Parameter Settings:

Clocking:

IWDG counter clock prescaler	4
IWDG down-counter reload value	4095

7.4. RCC

7.4.1. 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
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 2

7.5. SYS

Timebase Source: SysTick

7.6. TIM3

Clock Source : Internal Clock

7.6.1. 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)

7.7. WWDG

mode: Activated

7.7.1. Parameter Settings:

Watchdog Clocking:

WWDG counter clock prescaler	1
WWDG window value	64
WWDG free-running downcounter value	64

Watchdog Interrupt:

Early wakeup interrupt	Disable

*** 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	LUNG_PRESSURE
	PA5	ADC1_IN5	Analog mode	No pull-up and no pull-down	n/a	TANK_PRESSURE
	PA6	ADC1_IN6	Analog mode	No pull-up and no pull-down	n/a	FLOW_SENSOR_2
	PA7	ADC1_IN7	Analog mode	No pull-up and no pull-down	n/a	FLOW_SENSOR_1
GPIO	PB12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_DIAGNOSTIC_RED
	PB13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_DIAGNOSTIC_GREEN
	PB14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	FAULT_LED
	PB15	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	FAULT_BUZZER
	PD8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	COMPRESSOR_SWITCH
	PD9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	EXPIRED_VALVE
	PD10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	INSPIRED_VALVE
	PD11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	AIR_VALVE
	PD12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	O2_VALVE
	PC9	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	UI_BUTTON1
	PA8	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	UI_BUTTON_2
	PA9	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	UI_BUTTON_3
	PA10	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	UI_BUTTON_4
	PA11	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	UI_BUTTON_5
	PA12	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	UI_BUTTON_6
	PC10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LCD_RES
	PC11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LCD_WR
	PC12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LCD_RD
	PD0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LCD_DB7
	PD1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LCD_DB6
	PD2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LCD_DB5
	PD3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LCD_DB4
	PD4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LCD_DB3
	PD5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LCD_DB2
	PD6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LCD_DB1
	PD7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LCD_DB0
	PB5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LCS2CD_
	PB6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LCD_CS2
	PB7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LCD_A0

8.2. DMA configuration

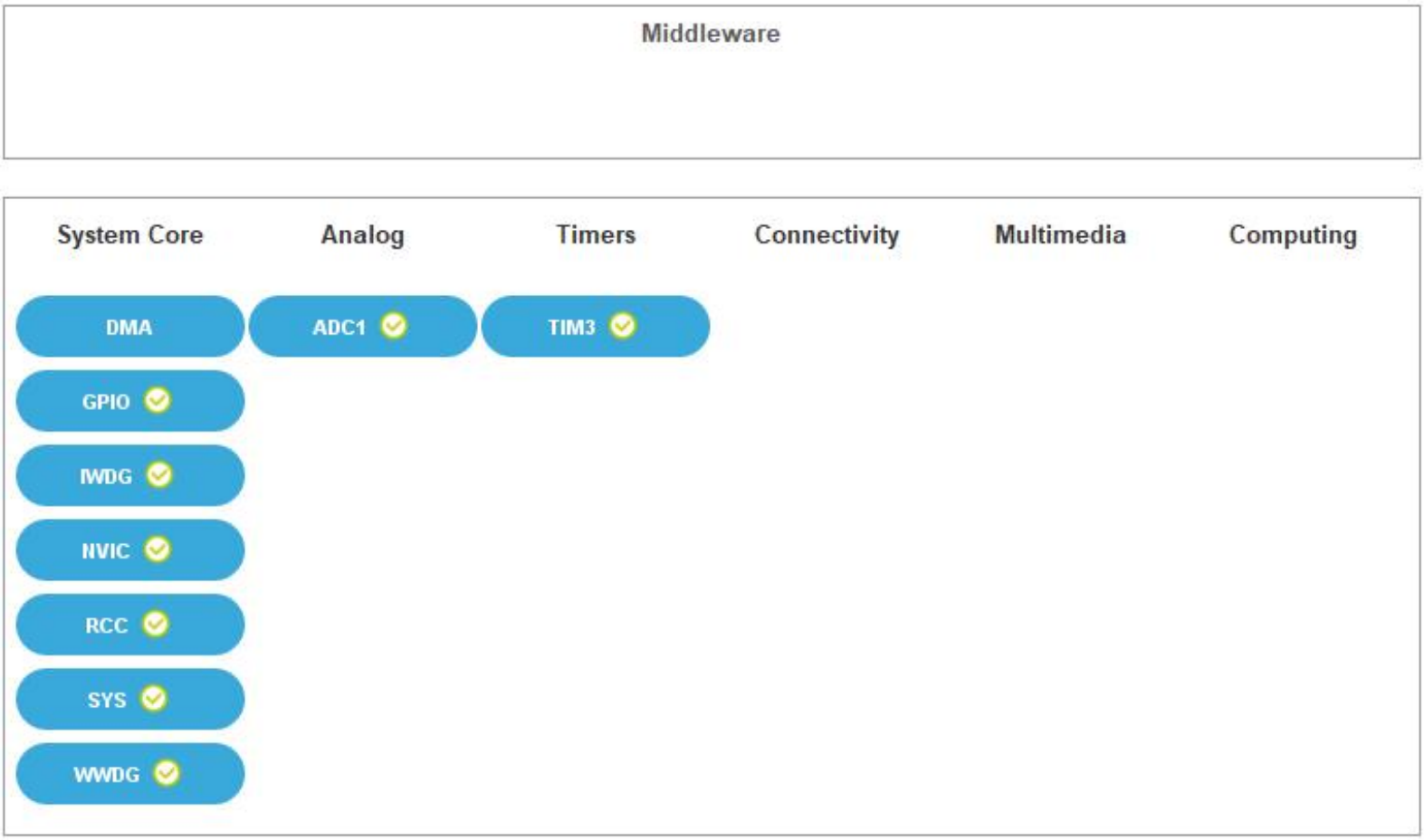
nothing configured in DMA service

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
ADC1 global interrupt	true	0	0
Window watchdog interrupt	unused		
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
TIM3 global interrupt	unused		
FPU global interrupt	unused		

*** User modified value**

9. Predefined Views - Category view : Current



10. Software Pack Report