



## 1. Description

### 1.1. Project

Project Name	Da_Vinci_Bitflip_v1_3
Board Name	custom
Generated with:	STM32CubeMX 6.8.1
Date	07/04/2023

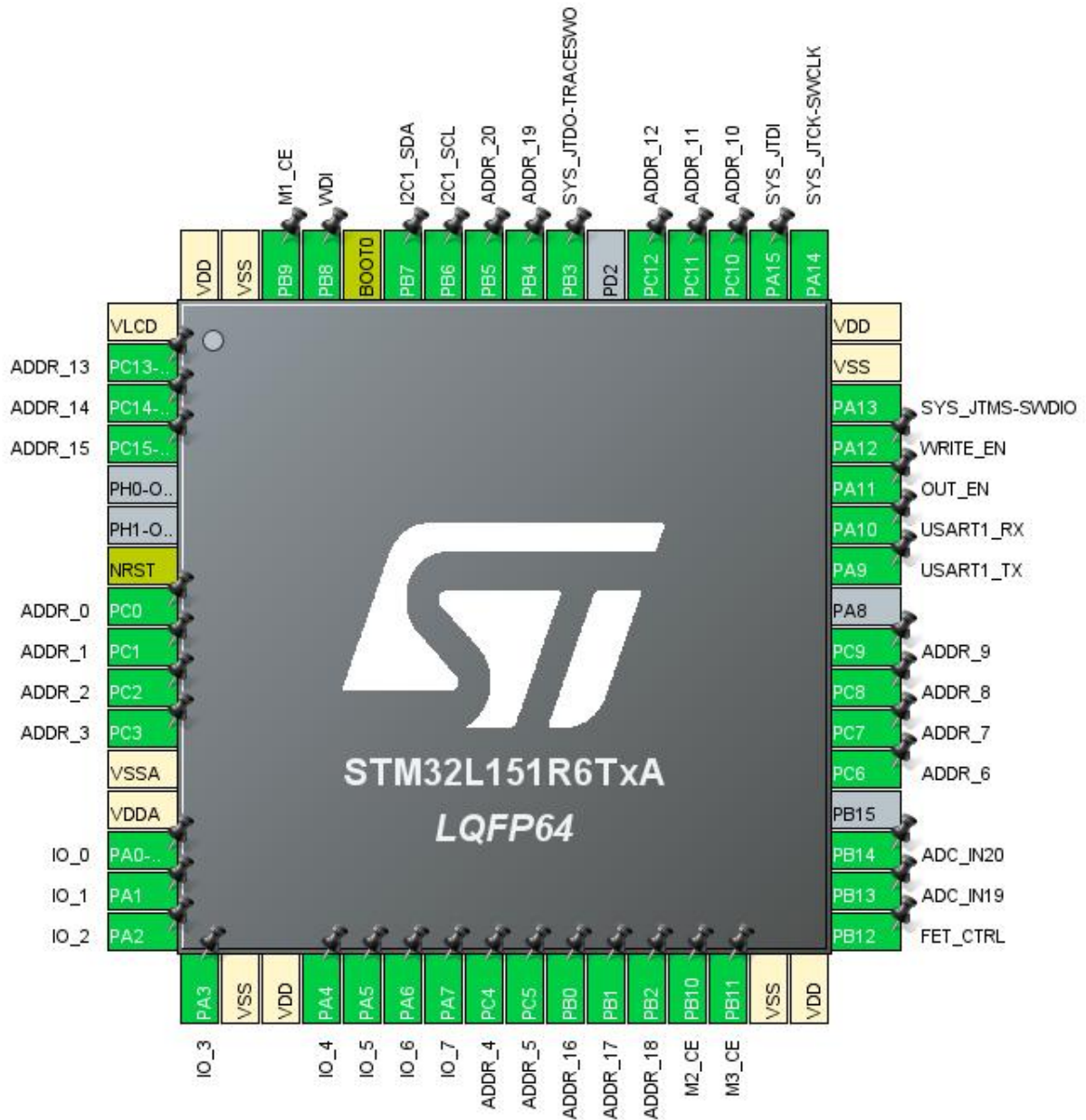
### 1.2. MCU

MCU Series	STM32L1
MCU Line	STM32L151/152
MCU name	STM32L151R6TxA
MCU Package	LQFP64
MCU Pin number	64

### 1.3. Core(s) information

Core(s)	Arm Cortex-M3
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## 2. Pinout Configuration



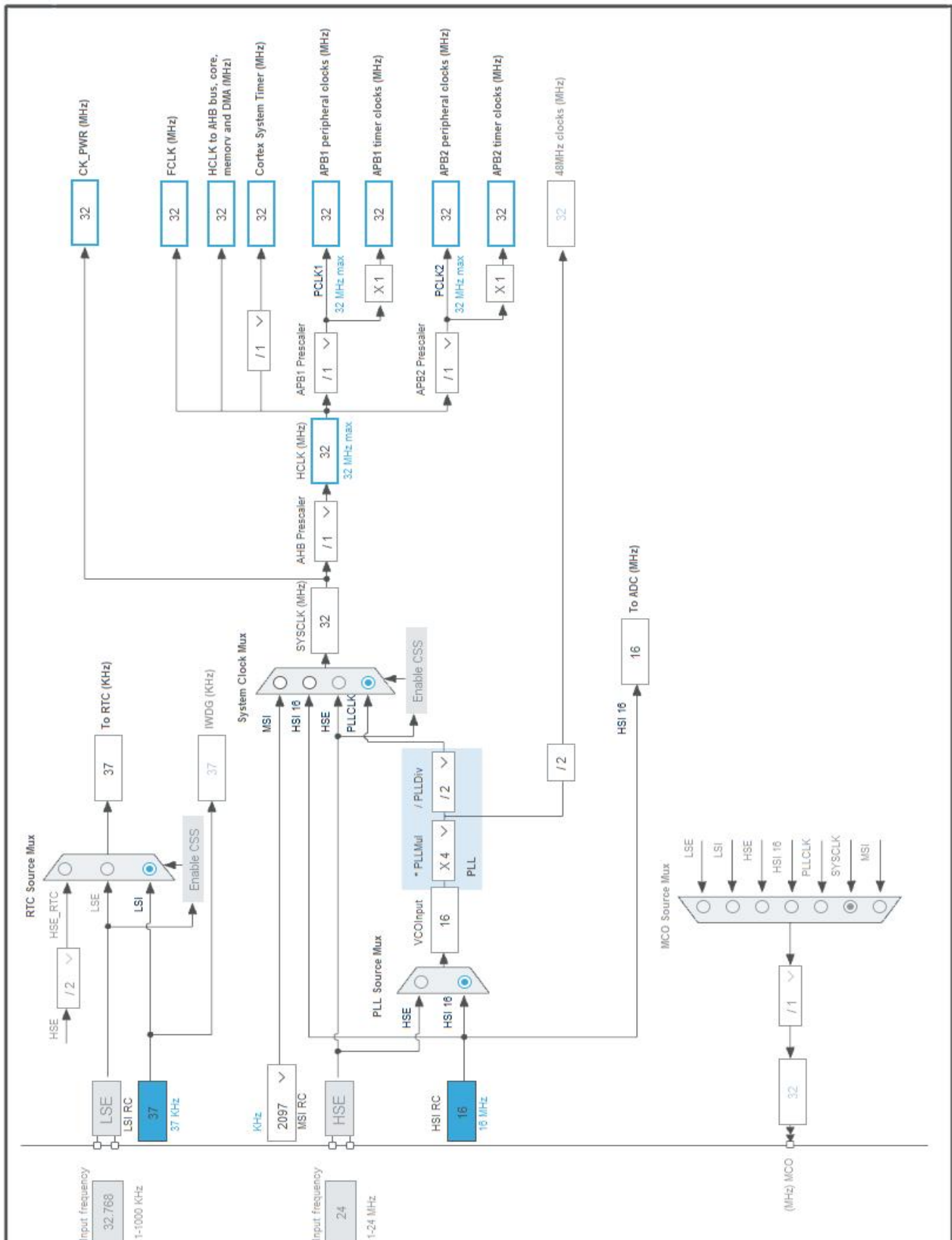
### 3. Pins Configuration

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VLCD	Power		
2	PC13-WKUP2 *	I/O	GPIO_Output	ADDR_13
3	PC14-OSC32_IN *	I/O	GPIO_Output	ADDR_14
4	PC15-OSC32_OUT *	I/O	GPIO_Output	ADDR_15
7	NRST	Reset		
8	PC0 *	I/O	GPIO_Output	ADDR_0
9	PC1 *	I/O	GPIO_Output	ADDR_1
10	PC2 *	I/O	GPIO_Output	ADDR_2
11	PC3 *	I/O	GPIO_Output	ADDR_3
12	VSSA	Power		
13	VDDA	Power		
14	PA0-WKUP1 *	I/O	GPIO_Output	IO_0
15	PA1 *	I/O	GPIO_Output	IO_1
16	PA2 *	I/O	GPIO_Output	IO_2
17	PA3 *	I/O	GPIO_Output	IO_3
18	VSS	Power		
19	VDD	Power		
20	PA4 *	I/O	GPIO_Output	IO_4
21	PA5 *	I/O	GPIO_Output	IO_5
22	PA6 *	I/O	GPIO_Output	IO_6
23	PA7 *	I/O	GPIO_Output	IO_7
24	PC4 *	I/O	GPIO_Output	ADDR_4
25	PC5 *	I/O	GPIO_Output	ADDR_5
26	PB0 *	I/O	GPIO_Output	ADDR_16
27	PB1 *	I/O	GPIO_Output	ADDR_17
28	PB2 *	I/O	GPIO_Output	ADDR_18
29	PB10 *	I/O	GPIO_Output	M2_CE
30	PB11 *	I/O	GPIO_Output	M3_CE
31	VSS	Power		
32	VDD	Power		
33	PB12 *	I/O	GPIO_Output	FET_CTRL
34	PB13	I/O	ADC_IN19	
35	PB14	I/O	ADC_IN20	
37	PC6 *	I/O	GPIO_Output	ADDR_6
38	PC7 *	I/O	GPIO_Output	ADDR_7
39	PC8 *	I/O	GPIO_Output	ADDR_8

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
40	PC9 *	I/O	GPIO_Output	ADDR_9
42	PA9	I/O	USART1_TX	
43	PA10	I/O	USART1_RX	
44	PA11 *	I/O	GPIO_Output	OUT_EN
45	PA12 *	I/O	GPIO_Output	WRITE_EN
46	PA13	I/O	SYS_JTMS-SWDIO	
47	VSS	Power		
48	VDD	Power		
49	PA14	I/O	SYS_JTCK-SWCLK	
50	PA15	I/O	SYS_JTDI	
51	PC10 *	I/O	GPIO_Output	ADDR_10
52	PC11 *	I/O	GPIO_Output	ADDR_11
53	PC12 *	I/O	GPIO_Output	ADDR_12
55	PB3	I/O	SYS_JTDO-TRACESWO	
56	PB4 *	I/O	GPIO_Output	ADDR_19
57	PB5 *	I/O	GPIO_Output	ADDR_20
58	PB6	I/O	I2C1_SCL	
59	PB7	I/O	I2C1_SDA	
60	BOOT0	Boot		
61	PB8 *	I/O	GPIO_Output	WDI
62	PB9 *	I/O	GPIO_Output	M1_CE
63	VSS	Power		
64	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	Da_Vinci_Bitflip_v1_3
Project Folder	C:\Users\matth\Documents\GitHub\bitflip_software
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_L1 V1.10.4
Application Structure	Advanced
Generate Under Root	Yes
Do not generate the main()	No
Minimum Heap Size	0x200
Minimum Stack Size	0x400

### 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	SystemClock_Config	RCC
2	MX_GPIO_Init	GPIO
3	MX_TIM10_Init	TIM10
4	MX_RTC_Init	RTC
5	MX_I2C1_Init	I2C1
6	MX_ADC_Init	ADC
7	MX_USART1_UART_Init	USART1

## 6. Power Consumption Calculator report

### 6.1. Microcontroller Selection

Series	STM32L1
Line	STM32L151/152
MCU	STM32L151R6TxA
Datasheet	DS9515_Rev4

### 6.2. Parameter Selection

Temperature	25
Vdd	3.0

### 6.3. Battery Selection

Battery	Li-SOCL2(AAA700)
Capacity	700.0 mAh
Self Discharge	0.08 %/month
Nominal Voltage	3.6 V
Max Cont Current	10.0 mA
Max Pulse Current	30.0 mA
Cells in series	1
Cells in parallel	1



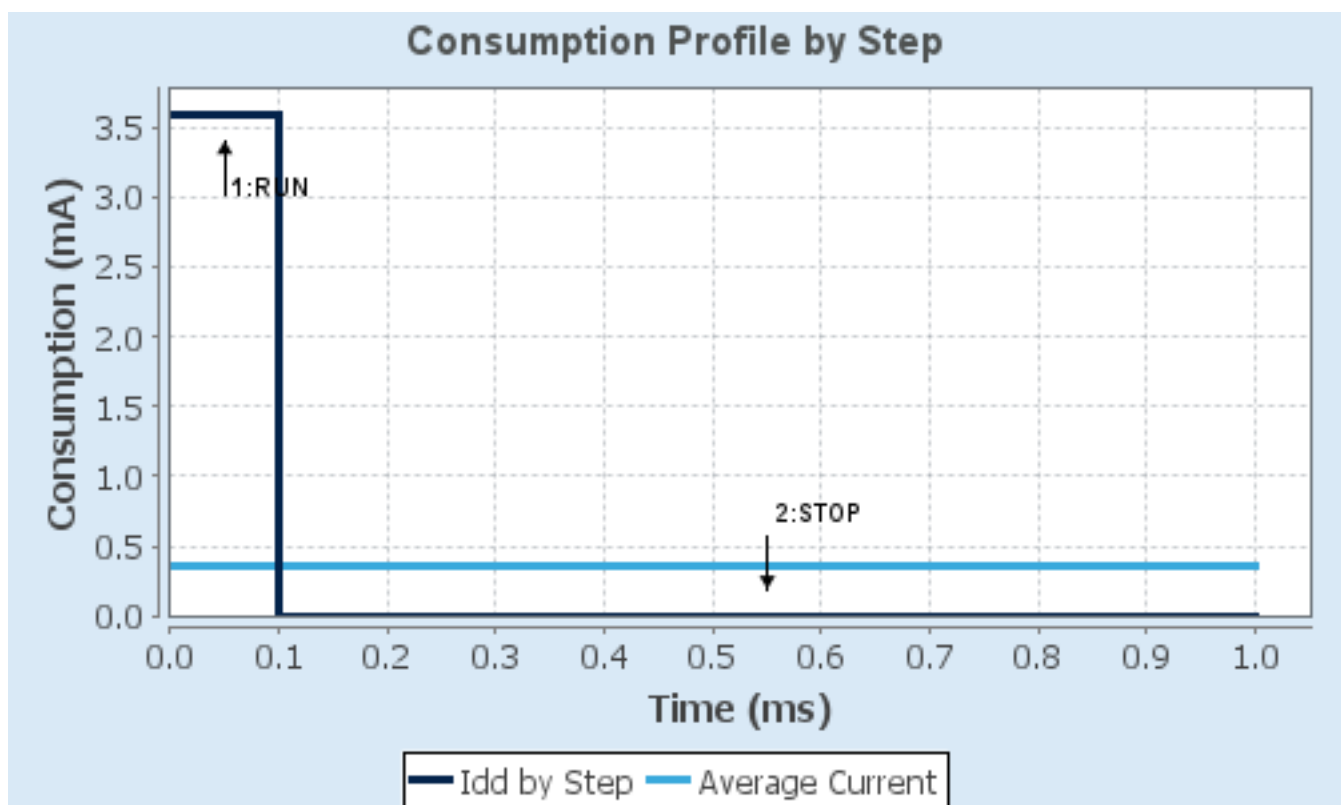
#### 6.4. Sequence

<b>Step</b>	Step1	Step2
<b>Mode</b>	RUN	STOP
<b>Vdd</b>	3.0	3.0
<b>Voltage Source</b>	Battery	Battery
<b>Range</b>	Range1-High	NoRange
<b>Fetch Type</b>	RAM	n/a
<b>CPU Frequency</b>	16 MHz	0 Hz
<b>Clock Configuration</b>	HSEBYP	ALL CLOCKS OFF
<b>Clock Source Frequency</b>	16 MHz	0 Hz
<b>Peripherals</b>		
<b>Additional Cons.</b>	0 mA	0 mA
<b>Average Current</b>	3.6 mA	434 nA
<b>Duration</b>	0.1 ms	0.9 ms
<b>DMIPS</b>	17.0	0.0
<b>Ta Max</b>	104.51	105
<b>Category</b>	In DS Table	In DS Table

#### 6.5. Results

Sequence Time	1 ms	Average Current	360.39 $\mu$ A
Battery Life	2 months, 19 days, 22 hours	Average DMIPS	16.5 DMIPS

#### 6.6. Chart



## 7. Peripherals and Middlewares Configuration

### 7.1. ADC

**mode: IN19**

**mode: IN20**

#### 7.1.1. Parameter Settings:

##### **ADC\_Settings:**

Clock Prescaler	Asynchronous clock mode divided by 1
Resolution	ADC 12-bit resolution
Data Alignment	Right alignment
Scan Mode	Disabled
Continuous Conversion Mode	Disabled
Discontinuous Conversion Mode	Disabled
DMA Continuous Requests	Disabled
End Of Conversion Selection	End of sequence conversion
Low Power Auto Wait	Disabled
Low Power Auto Off	Disabled

##### **ADC\_Regular\_ConversionMode:**

Number Of Conversion	1
External Trigger Conversion Source	Regular Conversion launched by software
External Trigger Conversion Edge	None
<u>Rank</u>	1
Channel	Channel 19
Sampling Time	4 Cycles

##### **ADC\_Injected\_ConversionMode:**

Number Of Conversions	0
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##### **WatchDog:**

Enable Analog WatchDog Mode	false
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### 7.2. I2C1

**I2C: I2C**

#### 7.2.1. Parameter Settings:

##### **Master Features:**

I2C Speed Mode	Standard Mode
I2C Clock Speed (Hz)	100000

##### **Slave Features:**

Clock No Stretch Mode	Disabled
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Primary Address Length selection	7-bit
Dual Address Acknowledged	Disabled
Primary slave address	<b>0x64 *</b>
General Call address detection	Disabled

## 7.3. RCC

### 7.3.1. Parameter Settings:

#### **System Parameters:**

VDD voltage (V)	3.3
Instruction Cache	Enabled
Prefetch Buffer	Disabled
Data Cache	Enabled
Flash Latency(WS)	1 WS (2 CPU cycle)

#### **RCC Parameters:**

HSI Calibration Value	16
MSI Calibration Value	0
HSE Startup Timeout Value (ms)	100
LSE Startup Timeout Value (ms)	5000

#### **Power Parameters:**

Power Regulator Voltage Scale	Power Regulator Voltage Scale 1
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## 7.4. RTC

**mode: Activate Clock Source**

**WakeUp: Internal WakeUp**

### 7.4.1. Parameter Settings:

#### **General:**

Hour Format	Hourformat 24
Asynchronous Predivider value	127
Synchronous Predivider value	255

#### **Calendar Time:**

Data Format	BCD data format
Hours	0
Minutes	0
Seconds	0
Day Light Saving: value of hour adjustment	Daylightsaving None

Store Operation                      Storeoperation Reset

**Calendar Date:**

Week Day	Monday
Month	January
Date	1
Year	0

**Wake UP:**

Wake Up Clock	RTCCLK / 16
Wake Up Counter	<b>4625 *</b>

## 7.5. SYS

**Debug: JTAG (4 pins)**

**Timebase Source: SysTick**

## 7.6. TIM10

**Clock Source : Internal Clock**

### 7.6.1. Parameter Settings:

**Counter Settings:**

Prescaler (PSC - 16 bits value)	<b>15 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value )	65535
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable

## 7.7. USART1

**Mode: Asynchronous**

### 7.7.1. 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
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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
ADC	PB13	ADC_IN19	Analog mode	No pull-up and no pull-down	n/a	
	PB14	ADC_IN20	Analog mode	No pull-up and no pull-down	n/a	
I2C1	PB6	I2C1_SCL	Alternate Function Open Drain	No pull-up and no pull-down	High *	
	PB7	I2C1_SDA	Alternate Function Open Drain	No pull-up and no pull-down	High *	
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
	PA15	SYS_JTDI	n/a	n/a	n/a	
	PB3	SYS_JTDO-TRACESWO	n/a	n/a	n/a	
USART1	PA9	USART1_TX	Alternate Function Push Pull	No pull-up and no pull-down	High *	
	PA10	USART1_RX	Alternate Function Push Pull	No pull-up and no pull-down	High *	
GPIO	PC13-WKUP2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	High *	ADDR_13
	PC14-OSC32_IN	GPIO_Output	Output Push Pull	No pull-up and no pull-down	High *	ADDR_14
	PC15-OSC32_OUT	GPIO_Output	Output Push Pull	No pull-up and no pull-down	High *	ADDR_15
	PC0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	High *	ADDR_0
	PC1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	High *	ADDR_1
	PC2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	High *	ADDR_2
	PC3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	High *	ADDR_3
	PA0-WKUP1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	High *	IO_0
	PA1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	High *	IO_1
	PA2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	High *	IO_2
	PA3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	High *	IO_3
	PA4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	High *	IO_4
	PA5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	High *	IO_5
	PA6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	High *	IO_6
	PA7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	High *	IO_7
	PC4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	High *	ADDR_4

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PC5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	<b>High *</b>	ADDR_5
	PB0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	<b>High *</b>	ADDR_16
	PB1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	<b>High *</b>	ADDR_17
	PB2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	<b>High *</b>	ADDR_18
	PB10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	<b>High *</b>	M2_CE
	PB11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	<b>High *</b>	M3_CE
	PB12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	<b>High *</b>	FET_CTRL
	PC6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	<b>High *</b>	ADDR_6
	PC7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	<b>High *</b>	ADDR_7
	PC8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	<b>High *</b>	ADDR_8
	PC9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	<b>High *</b>	ADDR_9
	PA11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	<b>High *</b>	OUT_EN
	PA12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	<b>High *</b>	WRITE_EN
	PC10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	<b>High *</b>	ADDR_10
	PC11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	<b>High *</b>	ADDR_11
	PC12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	<b>High *</b>	ADDR_12
	PB4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	<b>High *</b>	ADDR_19
	PB5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	<b>High *</b>	ADDR_20
	PB8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	<b>Low *</b>	WDI
	PB9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	<b>High *</b>	M1_CE

## 8.2. DMA configuration

nothing configured in DMA service



### 8.3. NVIC configuration

#### 8.3.1. 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	15	0
RTC wake-up interrupt through EXTI line 20	true	0	0
Flash global interrupt	unused		
RCC global interrupt	unused		
ADC global interrupt	unused		
TIM10 global interrupt	unused		
I2C1 event interrupt	unused		
I2C1 error interrupt	unused		
USART1 global interrupt	unused		

#### 8.3.2. NVIC Code generation

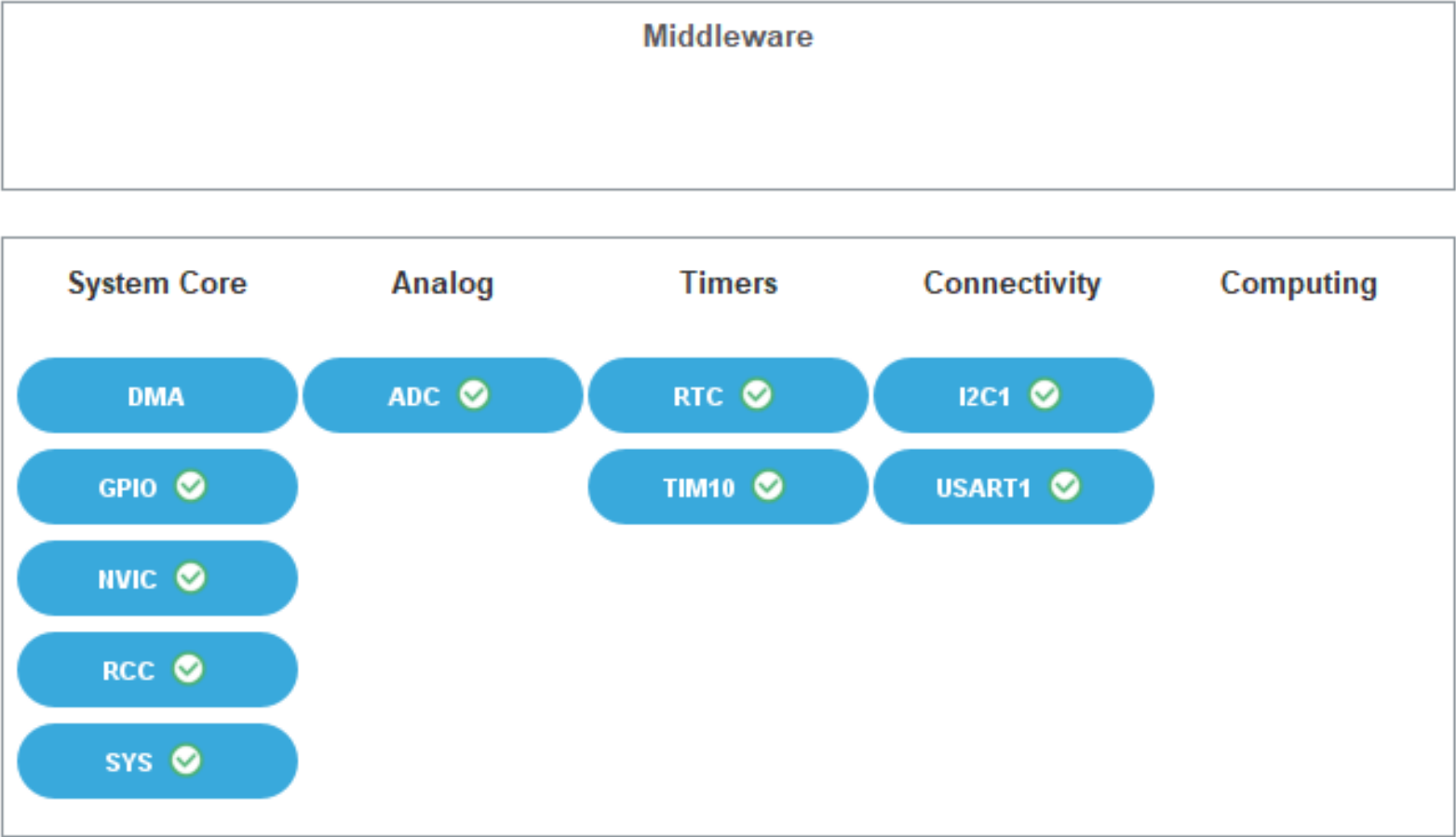
Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
Non maskable interrupt	false	true	false
Hard fault interrupt	false	true	false
Memory management fault	false	true	false
Pre-fetch fault, memory access fault	false	true	false
Undefined instruction or illegal 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
RTC wake-up interrupt through EXTI line 20	false	true	true

\* User modified value

## 9. System Views

### 9.1. Category view

#### 9.1.1. Current



## 10. Docs & Resources

Type	Link
BSDL files	<a href="https://www.st.com/resource/en/bsdl_model/stm32l1_bsdl.zip">https://www.st.com/resource/en/bsdl_model/stm32l1_bsdl.zip</a>
IBIS models	<a href="https://www.st.com/resource/en/ibis_model/stm32l1_ibis.zip">https://www.st.com/resource/en/ibis_model/stm32l1_ibis.zip</a>
System View Description	<a href="https://www.st.com/resource/en/svd/stm32l1_svd.zip">https://www.st.com/resource/en/svd/stm32l1_svd.zip</a>
BSDL files	<a href="https://www.st.com/resource/en/bsdl_model/stm32l1_bsdl.zip">https://www.st.com/resource/en/bsdl_model/stm32l1_bsdl.zip</a>
IBIS models	<a href="https://www.st.com/resource/en/ibis_model/stm32l1_ibis.zip">https://www.st.com/resource/en/ibis_model/stm32l1_ibis.zip</a>
System View Description	<a href="https://www.st.com/resource/en/svd/stm32l1_svd.zip">https://www.st.com/resource/en/svd/stm32l1_svd.zip</a>
Presentations	<a href="https://www.st.com/resource/en/product_presentation/stm32-stm8_embedded_software_solutions.pdf">https://www.st.com/resource/en/product_presentation/stm32-stm8_embedded_software_solutions.pdf</a>
Presentations	<a href="https://www.st.com/resource/en/product_presentation/stm32_eval-tools_portfolio.pdf">https://www.st.com/resource/en/product_presentation/stm32_eval-tools_portfolio.pdf</a>
Presentations	<a href="https://www.st.com/resource/en/product_presentation/stm32_stm8_functional-safety-packages.pdf">https://www.st.com/resource/en/product_presentation/stm32_stm8_functional-safety-packages.pdf</a>
Presentations	<a href="https://www.st.com/resource/en/product_presentation/stm32-stm8_software_development_tools.pdf">https://www.st.com/resource/en/product_presentation/stm32-stm8_software_development_tools.pdf</a>
Training Material	<a href="https://www.st.com/resource/en/sales_guide/sg_sc2157.pdf">https://www.st.com/resource/en/sales_guide/sg_sc2157.pdf</a>
Brochures	<a href="https://www.st.com/resource/en/brochure/brstm32ulp.pdf">https://www.st.com/resource/en/brochure/brstm32ulp.pdf</a>
Flyers	<a href="https://www.st.com/resource/en/flyer/flstm32nucleo.pdf">https://www.st.com/resource/en/flyer/flstm32nucleo.pdf</a>
Flyers	<a href="https://www.st.com/resource/en/flyer/flstm32trust.pdf">https://www.st.com/resource/en/flyer/flstm32trust.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an1181-electrostatic-discharge-sensitivity-measurement-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an1181-electrostatic-discharge-sensitivity-measurement-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an1709-emc-design-guide-for-stm8-stm32-and-legacy-mcus-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an1709-emc-design-guide-for-stm8-stm32-and-legacy-mcus-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an2606-stm32-microcontroller-system-memory-boot-mode-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an2606-stm32-microcontroller-system-memory-boot-mode-stmicroelectronics.pdf</a>
Application Notes	<a href="https://www.st.com/resource/en/application_note/an2639-soldering-recommendations-and-package-information-for-leadfree-ecopack-mcus-and-mpus-stmicroelectronics.pdf">https://www.st.com/resource/en/application_note/an2639-soldering-recommendations-and-package-information-for-leadfree-ecopack-mcus-and-mpus-stmicroelectronics.pdf</a>

Application Notes [https://www.st.com/resource/en/application\\_note/an2834-how-to-get-the-best-adc-accuracy-in-stm32-microcontrollers-stmicroelectronics.pdf](https://www.st.com/resource/en/application_note/an2834-how-to-get-the-best-adc-accuracy-in-stm32-microcontrollers-stmicroelectronics.pdf)

Application Notes [https://www.st.com/resource/en/application\\_note/an2867-oscillator-design-guide-for-stm8afals-stm32-mcus-and-mpus-stmicroelectronics.pdf](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/an3126-audio-and-waveform-generation-using-the-dac-in-stm32-products-stmicroelectronics.pdf](https://www.st.com/resource/en/application_note/an3126-audio-and-waveform-generation-using-the-dac-in-stm32-products-stmicroelectronics.pdf)

Application Notes [https://www.st.com/resource/en/application\\_note/an3155-usart-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf](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](https://www.st.com/resource/en/application_note/an3156-usb-dfu-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf)

Application Notes [https://www.st.com/resource/en/application\\_note/an3193-stm32l1xx-ultralow-power-features-overview-stmicroelectronics.pdf](https://www.st.com/resource/en/application_note/an3193-stm32l1xx-ultralow-power-features-overview-stmicroelectronics.pdf)

Application Notes [https://www.st.com/resource/en/application\\_note/an3216-getting-started-with-stm32l1xxx-hardware-development-stmicroelectronics.pdf](https://www.st.com/resource/en/application_note/an3216-getting-started-with-stm32l1xxx-hardware-development-stmicroelectronics.pdf)

Application Notes [https://www.st.com/resource/en/application\\_note/an3236-increase-the-number-of-touchkeys-for-touch-sensing-applications-on-mcus-stmicroelectronics.pdf](https://www.st.com/resource/en/application_note/an3236-increase-the-number-of-touchkeys-for-touch-sensing-applications-on-mcus-stmicroelectronics.pdf)

Application Notes [https://www.st.com/resource/en/application\\_note/an3248-using-stm32l1-analog-comparators-in-application-cases-stmicroelectronics.pdf](https://www.st.com/resource/en/application_note/an3248-using-stm32l1-analog-comparators-in-application-cases-stmicroelectronics.pdf)

Application Notes [https://www.st.com/resource/en/application\\_note/an3364-migration-and-compatibility-guidelines-for-stm32-microcontroller-applications-stmicroelectronics.pdf](https://www.st.com/resource/en/application_note/an3364-migration-and-compatibility-guidelines-for-stm32-microcontroller-applications-stmicroelectronics.pdf)

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