



## 1. Description

### 1.1. Project

Project Name	eCard
Board Name	custom
Generated with:	STM32CubeMX 6.7.0
Date	05/05/2023

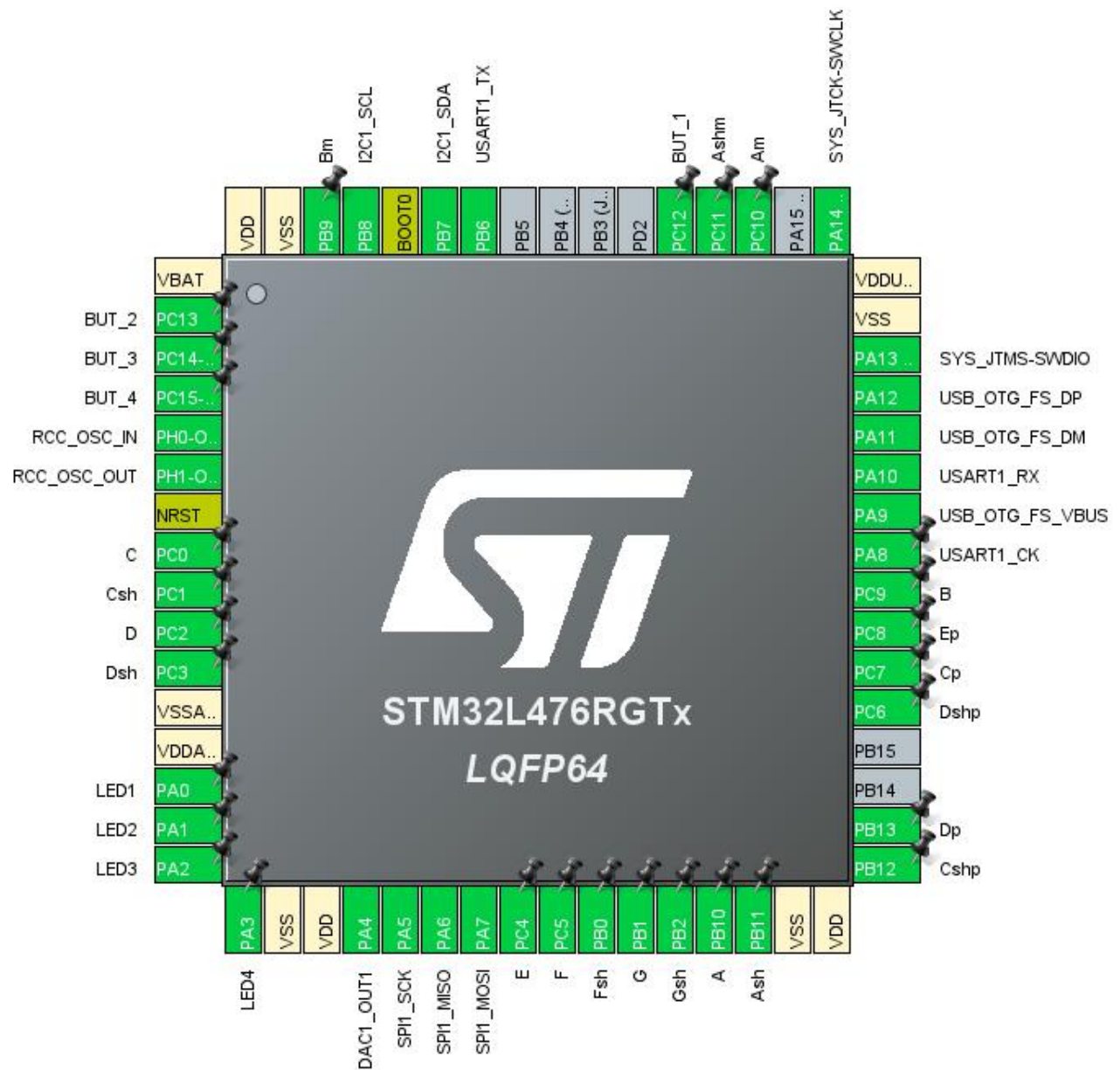
### 1.2. MCU

MCU Series	STM32L4
MCU Line	STM32L4x6
MCU name	STM32L476RGTx
MCU Package	LQFP64
MCU Pin number	64

### 1.3. Core(s) information

Core(s)	Arm Cortex-M4
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## 2. Pinout Configuration



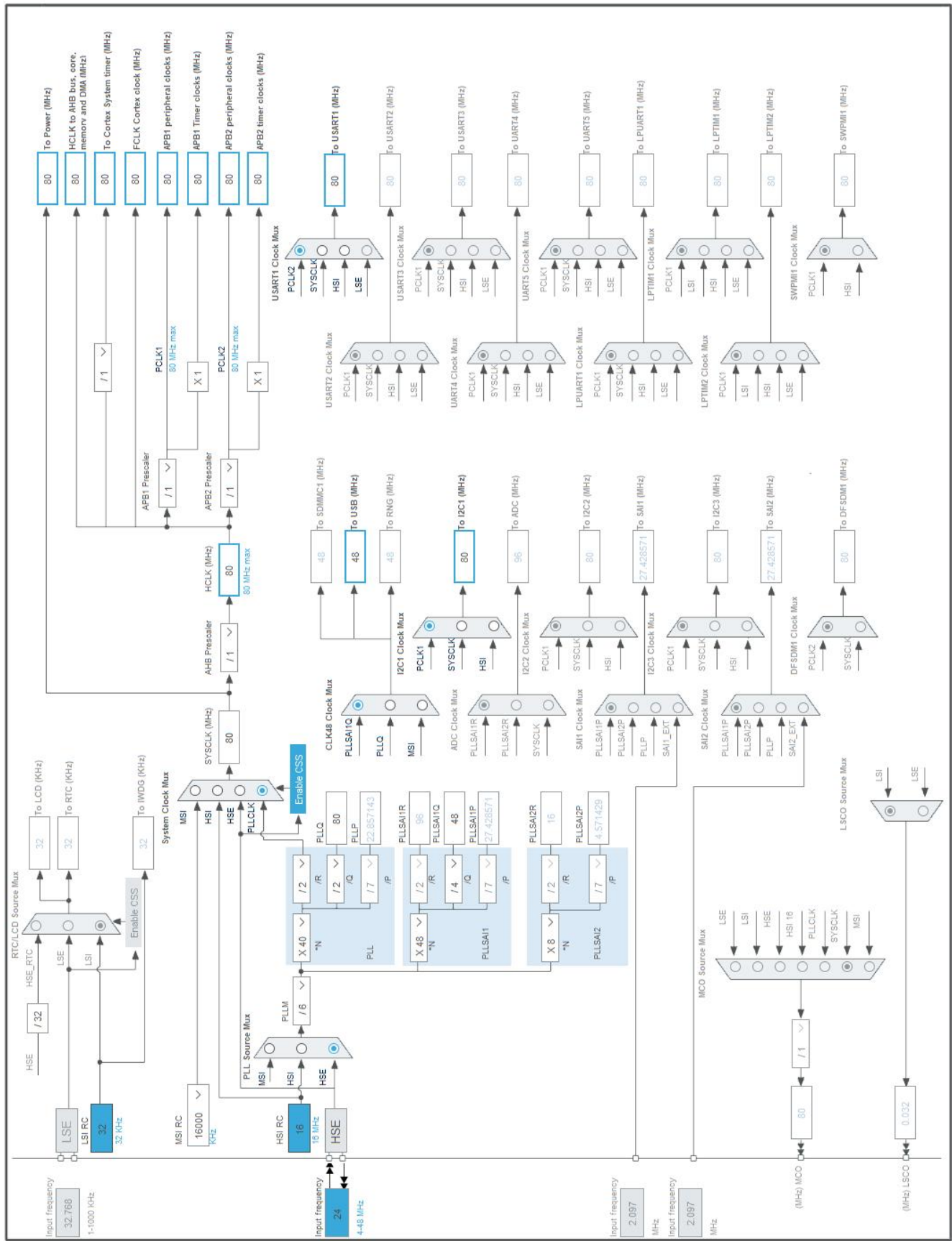
### 3. Pins Configuration

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
2	PC13 *	I/O	GPIO_Input	BUT_2
3	PC14-OSC32_IN (PC14) *	I/O	GPIO_Input	BUT_3
4	PC15-OSC32_OUT (PC15) *	I/O	GPIO_Input	BUT_4
5	PH0-OSC_IN (PH0)	I/O	RCC_OSC_IN	
6	PH1-OSC_OUT (PH1)	I/O	RCC_OSC_OUT	
7	NRST	Reset		
8	PC0 *	I/O	GPIO_Input	C
9	PC1 *	I/O	GPIO_Input	Csh
10	PC2 *	I/O	GPIO_Input	D
11	PC3 *	I/O	GPIO_Input	Dsh
12	VSSA/VREF-	Power		
13	VDDA/VREF+	Power		
14	PA0 *	I/O	GPIO_Output	LED1
15	PA1 *	I/O	GPIO_Output	LED2
16	PA2 *	I/O	GPIO_Output	LED3
17	PA3 *	I/O	GPIO_Output	LED4
18	VSS	Power		
19	VDD	Power		
20	PA4	I/O	DAC1_OUT1	
21	PA5	I/O	SPI1_SCK	
22	PA6	I/O	SPI1_MISO	
23	PA7	I/O	SPI1_MOSI	
24	PC4 *	I/O	GPIO_Input	E
25	PC5 *	I/O	GPIO_Input	F
26	PB0 *	I/O	GPIO_Input	Fsh
27	PB1 *	I/O	GPIO_Input	G
28	PB2 *	I/O	GPIO_Input	Gsh
29	PB10 *	I/O	GPIO_Input	A
30	PB11 *	I/O	GPIO_Input	Ash
31	VSS	Power		
32	VDD	Power		
33	PB12 *	I/O	GPIO_Input	Cshp
34	PB13 *	I/O	GPIO_Input	Dp
37	PC6 *	I/O	GPIO_Input	Dshp

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
38	PC7 *	I/O	GPIO_Input	Cp
39	PC8 *	I/O	GPIO_Input	Ep
40	PC9 *	I/O	GPIO_Input	B
41	PA8	I/O	USART1_CK	
42	PA9	I/O	USB_OTG_FS_VBUS	
43	PA10	I/O	USART1_RX	
44	PA11	I/O	USB_OTG_FS_DM	
45	PA12	I/O	USB_OTG_FS_DP	
46	PA13 (JTMS-SWDIO)	I/O	SYS_JTMS-SWDIO	
47	VSS	Power		
48	VDDUSB	Power		
49	PA14 (JTCK-SWCLK)	I/O	SYS_JTCK-SWCLK	
51	PC10 *	I/O	GPIO_Input	Am
52	PC11 *	I/O	GPIO_Input	Ashm
53	PC12 *	I/O	GPIO_Input	BUT_1
58	PB6	I/O	USART1_TX	
59	PB7	I/O	I2C1_SDA	
60	BOOT0	Boot		
61	PB8	I/O	I2C1_SCL	
62	PB9 *	I/O	GPIO_Input	Bm
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	eCard
Project Folder	E:\base_data\project\Stylophone_Card
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_L4 V1.17.2
Application Structure	Advanced
Generate Under Root	Yes
Do not generate the main()	No
Minimum Heap Size	0x4000
Minimum Stack Size	0x2000

### 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_DMA_Init	DMA
4	MX_DAC1_Init	DAC1
5	MX_TIM5_Init	TIM5
6	MX_I2C1_Init	I2C1
7	MX_SPI1_Init	SPI1
8	MX_USART1_Init	USART1
9	MX_USB_DEVICE_Init	USB_DEVICE





## 6. Power Consumption Calculator report

### 6.1. Microcontroller Selection

Series	STM32L4
Line	STM32L4x6
MCU	STM32L476RGTx
Datasheet	DS10198_Rev4

### 6.2. Parameter Selection

Temperature	25
Vdd	3.0

### 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

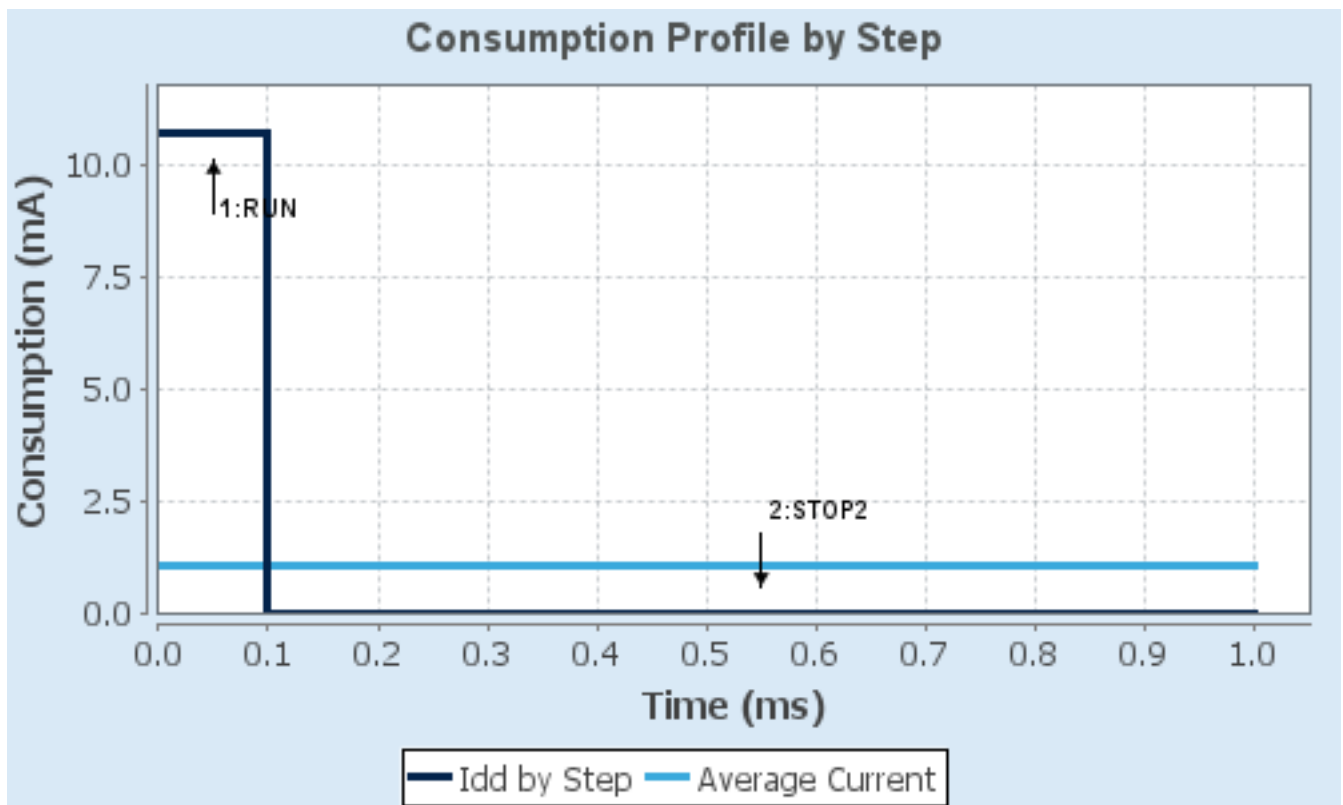
#### 6.4. Sequence

<b>Step</b>	Step1	Step2
<b>Mode</b>	RUN	STOP2
<b>Vdd</b>	3.0	3.0
<b>Voltage Source</b>	Battery	Battery
<b>Range</b>	Range1-High	NoRange
<b>Fetch Type</b>	SRAM2	n/a
<b>CPU Frequency</b>	80 MHz	0 Hz
<b>Clock Configuration</b>	HSE PLL	ALL CLOCKS OFF
<b>Clock Source Frequency</b>	4 MHz	0 Hz
<b>Peripherals</b>		
<b>Additional Cons.</b>	0 mA	0 mA
<b>Average Current</b>	10.7 mA	1.18 $\mu$ A
<b>Duration</b>	0.1 ms	0.9 ms
<b>DMIPS</b>	100.0	0.0
<b>Ta Max</b>	103.56	105
<b>Category</b>	In DS Table	In DS Table

#### 6.5. Results

Sequence Time	1 ms	Average Current	1.07 mA
Battery Life	4 months, 10 days, 3 hours	Average DMIPS	100.0 DMIPS

#### 6.6. Chart



## 7. Peripherals and Middlewares Configuration

### 7.1. DAC1

**OUT1 connected to: only to external pin**

#### 7.1.1. Parameter Settings:

##### **DAC Out1 Settings:**

Mode selected	Normal Mode
Output Buffer	Enable
Trigger	<b>Timer 5 Trigger Out event *</b>
Wave generation mode	Disabled
User Trimming	Factory trimming

### 7.2. I2C1

#### **I2C: I2C**

#### 7.2.1. Parameter Settings:

##### **Timing configuration:**

Custom Timing	Disabled
I2C Speed Mode	Standard Mode
I2C Speed Frequency (KHz)	100
Rise Time (ns)	0
Fall Time (ns)	0
Coefficient of Digital Filter	0
Analog Filter	Enabled
Timing	<b>0x10909CEC *</b>

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

Clock No Stretch Mode	Disabled
General Call Address Detection	Disabled
Primary Address Length selection	7-bit
Dual Address Acknowledged	Disabled
Primary slave address	0

### 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	Disabled
Data Cache	Enabled
Flash Latency(WS)	4 WS (5 CPU cycle)

**RCC Parameters:**

HSI Calibration Value	16
MSI Calibration Value	0
MSI Auto Calibration	Disabled
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. SPI1

**Mode: Full-Duplex Master****7.4.1. Parameter Settings:****Basic Parameters:**

Frame Format	Motorola
Data Size	4 Bits
First Bit	MSB First

**Clock Parameters:**

Prescaler (for Baud Rate)	2
Baud Rate	<b>40.0 MBits/s *</b>
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

**Advanced Parameters:**

CRC Calculation	Disabled
NSSP Mode	Enabled
NSS Signal Type	Software

## 7.5. SYS

**Debug: Serial Wire**

## 7.6. TIM5

### mode: Clock Source

#### 7.6.1. Parameter Settings:

##### Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 32 bits value )	<b>1666 *</b>
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 TRGO	<b>Update Event *</b>

## 7.7. USART1

### Mode: Synchronous

#### 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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##### Clock Parameters:

Clock Polarity	Low
Clock Phase	One Edge
Clock Last Bit	Disable

## 7.8. USB\_OTG\_FS

### Mode: Device\_Only

### Activate\_VBUS: VBUS sensing

#### 7.8.1. Parameter Settings:

Speed	Full Speed 12MBit/s
Low power	Disabled
Battery charging	Enabled
Link Power Management	Disabled
VBUS sensing	Enabled
Signal start of frame	Disabled

## 7.9. STMicroelectronics.X-CUBE-ALGOBUILD.1.3.0 mode: DSPoolLibraryJjLibrary

### 7.10. USB\_DEVICE

#### Class For FS IP: Audio Device Class

##### 7.10.1. Parameter Settings:

###### Basic Parameters:

USBD_MAX_NUM_INTERFACES (Maximum number of supported interfaces)	<b>3 *</b>
USBD_MAX_NUM_CONFIGURATION (Maximum number of supported configuration)	1
USBD_MAX_STR_DESC_SIZ (Maximum size for the string descriptors)	512
USBD_SELF_POWERED (Enabled self power)	Enabled
USBD_DEBUG_LEVEL (USBD Debug Level)	0: No debug message
USBD_LPM_ENABLED (Link Power Management)	1: Link Power Management supported

###### Class Parameters:

USBD_AUDIO_FREQ (Audio sample frequency rate)	<b>48000 *</b>
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##### 7.10.2. Device Descriptor:

###### Device Descriptor:

VID (Vendor Identifier)	<b>1159 *</b>
LANGID_STRING (Language Identifier)	English(United States)
MANUFACTURER_STRING (Manufacturer Identifier)	<b>DarkFox *</b>

###### Device Descriptor FS:

PID (Product Identifier)	22336
PRODUCT_STRING (Product Identifier)	<b>Stylophone Card *</b>
CONFIGURATION_STRING (Configuration Identifier)	AUDIO Config
INTERFACE_STRING (Interface Identifier)	AUDIO Interface

**\* User modified value**



## 8. System Configuration

### 8.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
DAC1	PA4	DAC1_OUT1	Analog mode	No pull-up and no pull-down	n/a	
I2C1	PB7	I2C1_SDA	Alternate Function Open Drain	No pull-up and no pull-down	<b>Very High *</b>	
	PB8	I2C1_SCL	Alternate Function Open Drain	No pull-up and no pull-down	<b>Very High *</b>	
RCC	PH0-OSC_IN (PH0)	RCC_OSC_IN	n/a	n/a	n/a	
	PH1-OSC_OUT (PH1)	RCC_OSC_OUT	n/a	n/a	n/a	
SPI1	PA5	SPI1_SCK	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High *</b>	
	PA6	SPI1_MISO	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High *</b>	
	PA7	SPI1_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High *</b>	
SYS	PA13 (JTMS-SWDIO)	SYS_JTMS-SWDIO	n/a	n/a	n/a	
	PA14 (JTCK-SWCLK)	SYS_JTCK-SWCLK	n/a	n/a	n/a	
USART1	PA8	USART1_CK	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High *</b>	
	PA10	USART1_RX	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High *</b>	
	PB6	USART1_TX	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High *</b>	
USB_OTG_FS	PA9	USB_OTG_FS_VBUS	Input mode	No pull-up and no pull-down	n/a	
	PA11	USB_OTG_FS_DM	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High *</b>	
	PA12	USB_OTG_FS_DP	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High *</b>	
GPIO	PC13	GPIO_Input	Input mode	<b>Pull-up *</b>	n/a	BUT_2
	PC14-	GPIO_Input	Input mode		n/a	BUT_3

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	OSC32_IN (PC14)			<b>Pull-up *</b>		
	PC15-OSC32_OUT (PC15)	GPIO_Input	Input mode	<b>Pull-up *</b>	n/a	BUT_4
	PC0	GPIO_Input	Input mode	<b>Pull-up *</b>	n/a	C
	PC1	GPIO_Input	Input mode	<b>Pull-up *</b>	n/a	Csh
	PC2	GPIO_Input	Input mode	<b>Pull-up *</b>	n/a	D
	PC3	GPIO_Input	Input mode	<b>Pull-up *</b>	n/a	Dsh
	PA0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED1
	PA1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED2
	PA2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED3
	PA3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED4
	PC4	GPIO_Input	Input mode	<b>Pull-up *</b>	n/a	E
	PC5	GPIO_Input	Input mode	<b>Pull-up *</b>	n/a	F
	PB0	GPIO_Input	Input mode	<b>Pull-up *</b>	n/a	Fsh
	PB1	GPIO_Input	Input mode	<b>Pull-up *</b>	n/a	G
	PB2	GPIO_Input	Input mode	<b>Pull-up *</b>	n/a	Gsh
	PB10	GPIO_Input	Input mode	<b>Pull-up *</b>	n/a	A
	PB11	GPIO_Input	Input mode	<b>Pull-up *</b>	n/a	Ash
	PB12	GPIO_Input	Input mode	<b>Pull-up *</b>	n/a	Cshp
	PB13	GPIO_Input	Input mode	<b>Pull-up *</b>	n/a	Dp
	PC6	GPIO_Input	Input mode	<b>Pull-up *</b>	n/a	Dshp
	PC7	GPIO_Input	Input mode	<b>Pull-up *</b>	n/a	Cp
	PC8	GPIO_Input	Input mode	<b>Pull-up *</b>	n/a	Ep
	PC9	GPIO_Input	Input mode	<b>Pull-up *</b>	n/a	B
	PC10	GPIO_Input	Input mode	<b>Pull-up *</b>	n/a	Am
	PC11	GPIO_Input	Input mode	<b>Pull-up *</b>	n/a	Ashm
	PC12	GPIO_Input	Input mode	<b>Pull-up *</b>	n/a	BUT_1
	PB9	GPIO_Input	Input mode	<b>Pull-up *</b>	n/a	Bm

## 8.2. DMA configuration

DMA request	Stream	Direction	Priority
DAC_CH1	DMA1_Channel3	Memory To Peripheral	<b>High *</b>

### DAC\_CH1: DMA1\_Channel3 DMA request Settings:

Mode: Normal  
Peripheral Increment: Disable  
Memory Increment: **Enable \***  
Peripheral Data Width: Half Word  
Memory Data Width: **Word \***

### 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
Prefetch 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
DMA1 channel3 global interrupt	true	0	0
USB OTG FS global interrupt	true	0	0
PVD/PVM1/PVM2/PVM3/PVM4 interrupts through EXTI lines 16/35/36/37/38	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
I2C1 event interrupt	unused		
I2C1 error interrupt	unused		
SPI1 global interrupt	unused		
USART1 global interrupt	unused		
TIM5 global interrupt	unused		
TIM6 global interrupt, DAC channel1 and channel2 underrun error interrupts	unused		
FPU 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
Prefetch 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
DMA1 channel3 global interrupt	false	true	true

Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
USB OTG FS global interrupt	false	true	true

\* User modified value

## 9. System Views

### 9.1. Category view

#### 9.1.1. Current

## 10. Software Pack Report

### 10.1. Software Pack selected

Vendor	Name	Version	Component
STMicroelectronics	X-CUBE-ALGOBUILD	1.3.0	Class : DSP Library Group : DSP Library Version : 1.3.0

## 11. Docs & Resources

Type	Link
BSDL files	<a href="https://www.st.com/resource/en/bsdl_model/stm32l4_bsd1.zip">https://www.st.com/resource/en/bsdl_model/stm32l4_bsd1.zip</a>
IBIS models	<a href="https://www.st.com/resource/en/ibis_model/stm32l4_ibis.zip">https://www.st.com/resource/en/ibis_model/stm32l4_ibis.zip</a>
System View Description	<a href="https://www.st.com/resource/en/svd/stm32l4_svd.zip">https://www.st.com/resource/en/svd/stm32l4_svd.zip</a>
BSDL files	<a href="https://www.st.com/resource/en/bsdl_model/stm32l4_bsd1.zip">https://www.st.com/resource/en/bsdl_model/stm32l4_bsd1.zip</a>
IBIS models	<a href="https://www.st.com/resource/en/ibis_model/stm32l4_ibis.zip">https://www.st.com/resource/en/ibis_model/stm32l4_ibis.zip</a>
System View Description	<a href="https://www.st.com/resource/en/svd/stm32l4_svd.zip">https://www.st.com/resource/en/svd/stm32l4_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>
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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/stm32l4_marketing-pres.pdf">https://www.st.com/resource/en/product_presentation/stm32l4_marketing-pres.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/flstm32l4.pdf">https://www.st.com/resource/en/flyer/flstm32l4.pdf</a>
Flyers	<a href="https://www.st.com/resource/en/flyer/flstm32nucleo.pdf">https://www.st.com/resource/en/flyer/flstm32nucleo.pdf</a>
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Flyers	<a href="https://www.st.com/resource/en/flyer/flstm32trust.pdf">https://www.st.com/resource/en/flyer/flstm32trust.pdf</a>
Flyers	<a href="https://www.st.com/resource/en/flyer/flstm32gui.pdf">https://www.st.com/resource/en/flyer/flstm32gui.pdf</a>
Magazine Articles	<a href="https://www.st.com/resource/en/magazine/design-elektronik_august2017.pdf">https://www.st.com/resource/en/magazine/design-elektronik_august2017.pdf</a>
Magazine Articles	<a href="https://www.st.com/resource/en/magazine/design-">https://www.st.com/resource/en/magazine/design-</a>



	elektronik_october2016.pdf
Product Certifications	<a href="https://www.st.com/resource/en/certification_document/sesip-2000002-01-cert.pdf">https://www.st.com/resource/en/certification_document/sesip-2000002-01-cert.pdf</a>
Product Certifications	<a href="https://www.st.com/resource/en/certification_document/sesip-2000002-01-st2.pdf">https://www.st.com/resource/en/certification_document/sesip-2000002-01-st2.pdf</a>
Product Certifications	<a href="https://www.st.com/resource/en/certification_document/psa-certificate_stm32l4.pdf">https://www.st.com/resource/en/certification_document/psa-certificate_stm32l4.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	<a href="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</a>
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