



1. Description

1.1. Project

Project Name	f412_vcp
Board Name	STM32F412G-DISCO
Generated with:	STM32CubeMX 6.2.1
Date	09/15/2021

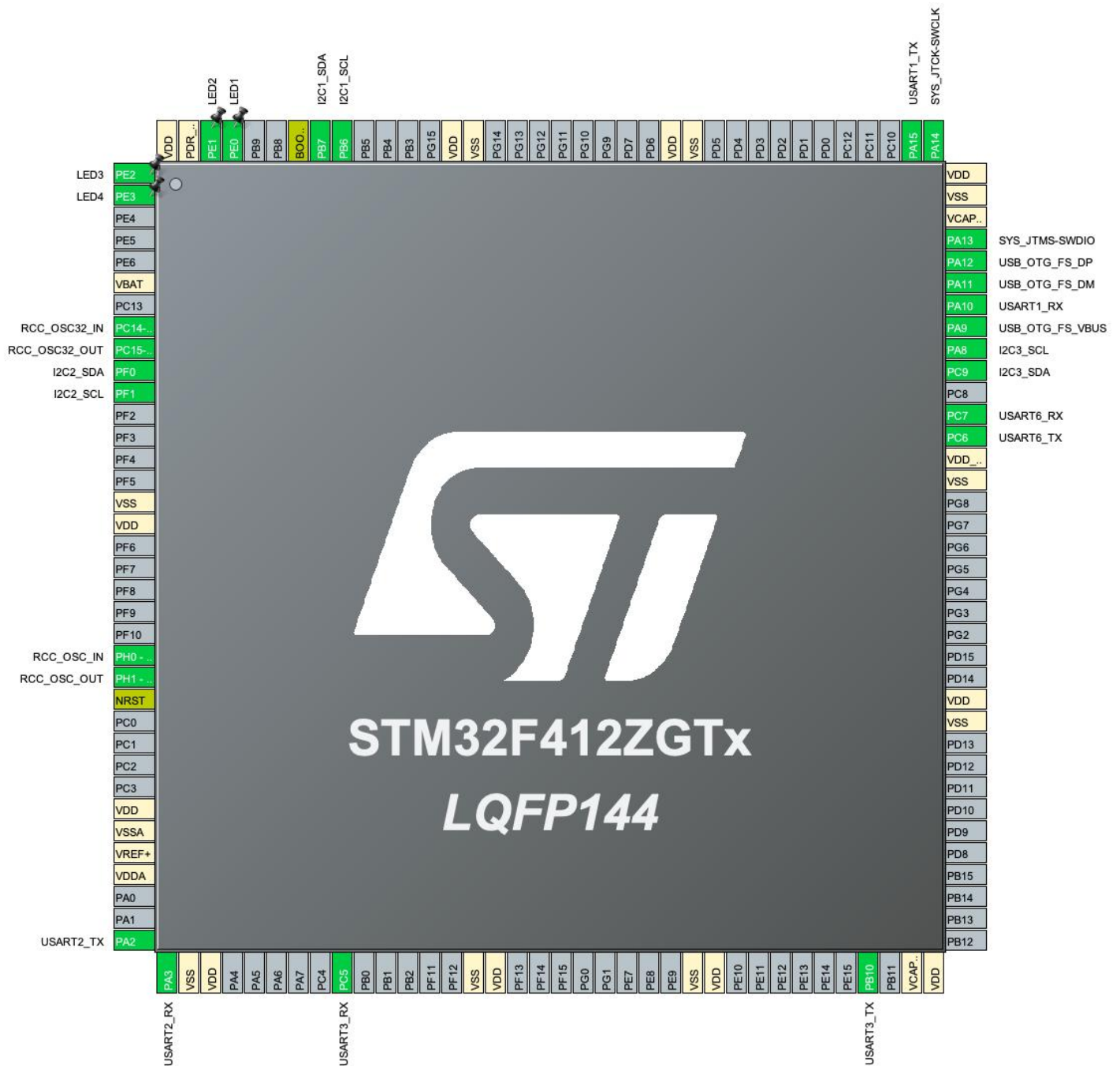
1.2. MCU

MCU Series	STM32F4
MCU Line	STM32F412
MCU name	STM32F412ZGTx
MCU Package	LQFP144
MCU Pin number	144

1.3. Core(s) information

Core(s)	Arm Cortex-M4
---------	---------------

2. Pinout Configuration



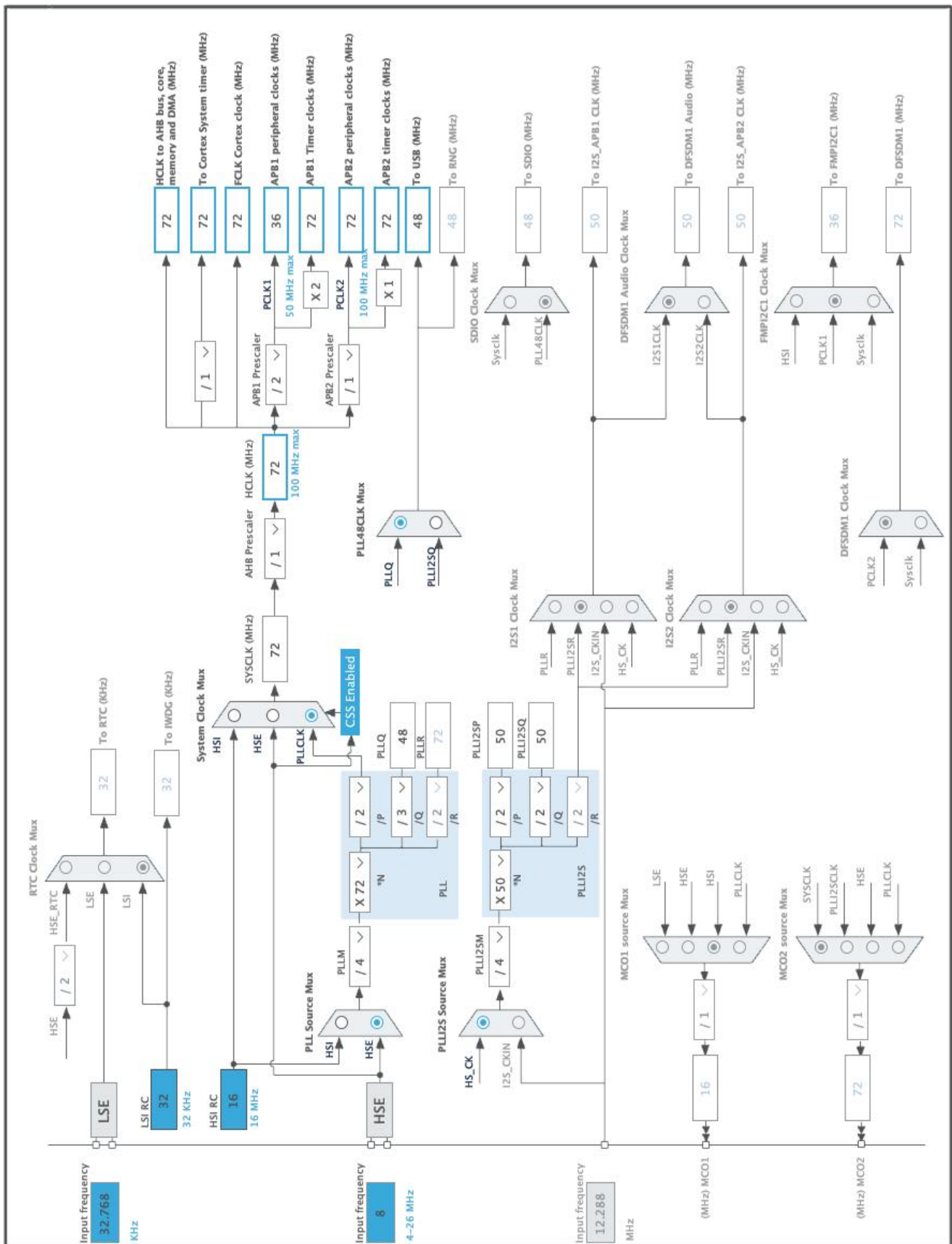
3. Pins Configuration

Pin Number LQFP144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	PE2 *	I/O	GPIO_Output	LED3
2	PE3 *	I/O	GPIO_Output	LED4
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	I2C2_SDA	
11	PF1	I/O	I2C2_SCL	
16	VSS	Power		
17	VDD	Power		
23	PH0 - OSC_IN	I/O	RCC_OSC_IN	
24	PH1 - OSC_OUT	I/O	RCC_OSC_OUT	
25	NRST	Reset		
30	VDD	Power		
31	VSSA	Power		
32	VREF+	Power		
33	VDDA	Power		
36	PA2	I/O	USART2_TX	
37	PA3	I/O	USART2_RX	
38	VSS	Power		
39	VDD	Power		
45	PC5	I/O	USART3_RX	
51	VSS	Power		
52	VDD	Power		
61	VSS	Power		
62	VDD	Power		
69	PB10	I/O	USART3_TX	
71	VCAP_1	Power		
72	VDD	Power		
83	VSS	Power		
84	VDD	Power		
94	VSS	Power		
95	VDD_USB	Power		
96	PC6	I/O	USART6_TX	
97	PC7	I/O	USART6_RX	
99	PC9	I/O	I2C3_SDA	
100	PA8	I/O	I2C3_SCL	

Pin Number LQFP144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
101	PA9	I/O	USB_OTG_FS_VBUS	
102	PA10	I/O	USART1_RX	
103	PA11	I/O	USB_OTG_FS_DM	
104	PA12	I/O	USB_OTG_FS_DP	
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	USART1_TX	
120	VSS	Power		
121	VDD	Power		
130	VSS	Power		
131	VDD	Power		
136	PB6	I/O	I2C1_SCL	
137	PB7	I/O	I2C1_SDA	
138	BOOT0	Boot		
141	PE0 *	I/O	GPIO_Output	LED1
142	PE1 *	I/O	GPIO_Output	LED2
143	PDR_ON	Power		
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	f412_vcp
Project Folder	/Users/yetkinakyuz/ARM Projects/f412_vcp
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_F4 V1.26.2
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	MX_GPIO_Init	GPIO
2	SystemClock_Config	RCC
3	MX_USB_DEVICE_Init	USB_DEVICE
4	MX_I2C1_Init	I2C1
5	MX_I2C2_Init	I2C2
6	MX_I2C3_Init	I2C3
7	MX_USART1_UART_Init	USART1
8	MX_USART2_UART_Init	USART2
9	MX_USART3_UART_Init	USART3
10	MX_USART6_UART_Init	USART6

6. Power Consumption Calculator report

6.1. Microcontroller Selection

Series	STM32F4
Line	STM32F412
MCU	STM32F412ZGTx
Datasheet	DS11139_Rev5

6.2. Parameter Selection

Temperature	25
Vdd	1.7

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

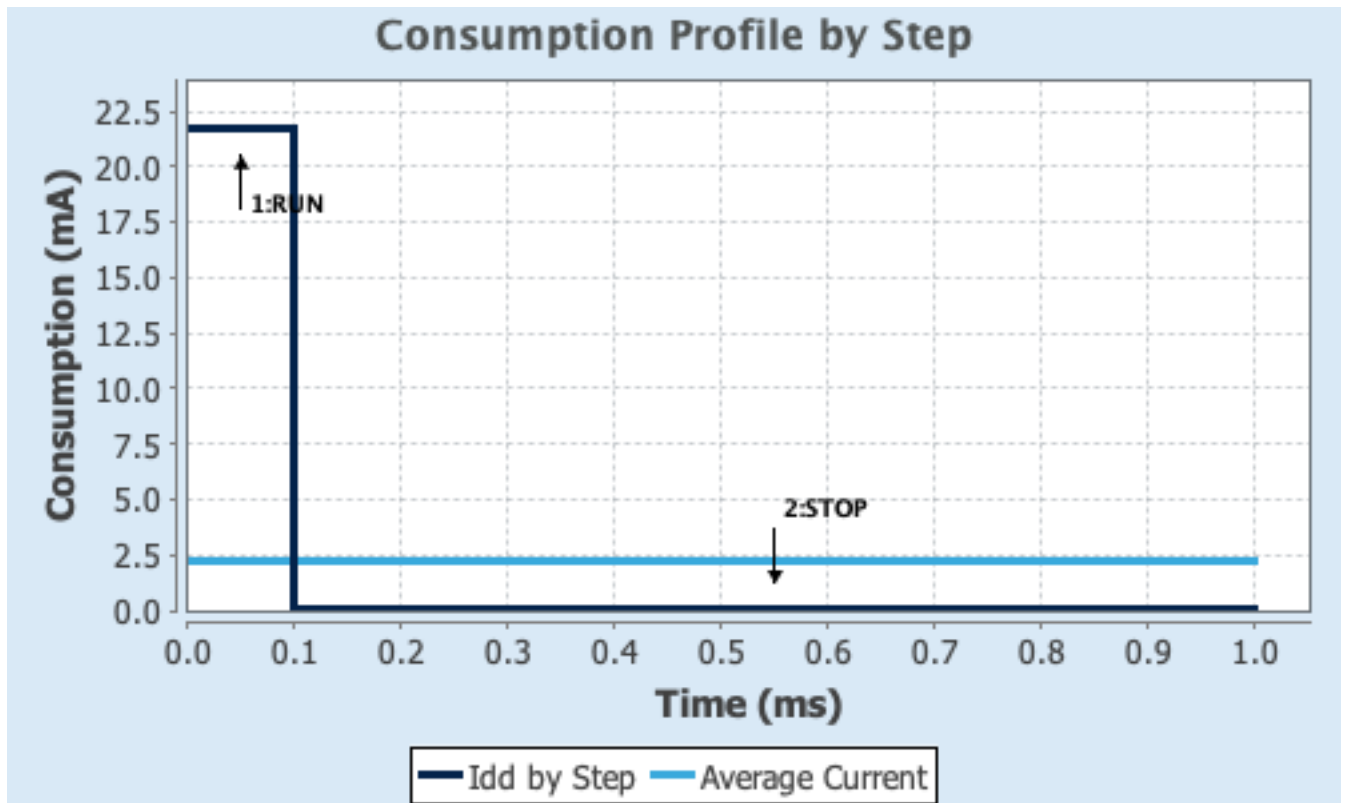
6.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP
Vdd	1.7	1.7
Voltage Source	Battery	Battery
Range	Scale1-High	No Scale
Fetch Type	FLASH	n/a
CPU Frequency	100 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	21.7 mA	18.5 μ A
Duration	0.1 ms	0.9 ms
DMIPS	125.0	0.0
Ta Max	103.71	105
Category	In DS Table	In DS Table

6.5. Results

Sequence Time	1 ms	Average Current	2.19 mA
Battery Life	2 months, 3 days, 20 hours	Average DMIPS	125.0 DMIPS

6.6. Chart



7. Peripherals and Middlewares Configuration

7.1. I2C1

I2C: I2C

7.1.1. Parameter Settings:

Master Features:

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

Slave Features:

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

7.2. I2C2

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
Primary Address Length selection	7-bit
Dual Address Acknowledged	Disabled
Primary slave address	0
General Call address detection	Disabled

7.3. I2C3

I2C: I2C

7.3.1. Parameter Settings:

Master Features:

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

Slave Features:

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

7.4. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

Low Speed Clock (LSE) : Crystal/Ceramic Resonator

7.4.1. Parameter Settings:**System Parameters:**

VDD voltage (V)	3.3
Instruction Cache	Enabled
Prefetch Buffer	Enabled
Data Cache	Enabled
Flash Latency(WS)	2 WS (3 CPU cycle)

RCC Parameters:

HSI Calibration Value	16
TIM Prescaler Selection	Disabled
HSE Startup Timeout Value (ms)	100
LSE Startup Timeout Value (ms)	5000

Power Parameters:

Power Regulator Voltage Scale	Power Regulator Voltage Scale 1
-------------------------------	---------------------------------

7.5. SYS

Debug: Serial Wire

Timebase Source: SysTick

7.6. USART1

Mode: Asynchronous

7.6.1. 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

7.7. USART2

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
Over Sampling	16 Samples

7.8. USART3

Mode: Asynchronous

7.8.1. 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

7.9. USART6

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. USB_OTG_FS

Mode: Device_Only

Activate_VBUS: VBUS sensing

7.10.1. 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

7.11. USB_DEVICE

Class For FS IP: Communication Device Class (Virtual Port Com)

7.11.1. Parameter Settings:

Basic Parameters:

USBD_MAX_NUM_INTERFACES (Maximum number of supported interfaces)	1
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:

USB CDC Rx Buffer Size	2048
USB CDC Tx Buffer Size	2048

7.11.2. Device Descriptor:

Device Descriptor:

VID (Vendor Identifier)	1155
LANGID_STRING (Language Identifier)	English(United States)
MANUFACTURER_STRING (Manufacturer Identifier)	STMicroelectronics

Device Descriptor FS:

PID (Product Identifier)	22336
PRODUCT_STRING (Product Identifier)	STM32 Virtual ComPort
CONFIGURATION_STRING (Configuration Identifier)	CDC Config
INTERFACE_STRING (Interface Identifier)	CDC 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
I2C1	PB6	I2C1_SCL	Alternate Function Open Drain	Pull-up	Very High *	
	PB7	I2C1_SDA	Alternate Function Open Drain	Pull-up	Very High *	
I2C2	PF0	I2C2_SDA	Alternate Function Open Drain	Pull-up	Very High *	
	PF1	I2C2_SCL	Alternate Function Open Drain	Pull-up	Very High *	
I2C3	PC9	I2C3_SDA	Alternate Function Open Drain	Pull-up	Very High *	
	PA8	I2C3_SCL	Alternate Function Open Drain	Pull-up	Very High *	
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	
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
USART1	PA10	USART1_RX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
	PA15	USART1_TX	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	PC5	USART3_RX	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
	PB10	USART3_TX	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 *	
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	Very High *	
	PA12	USB_OTG_FS_DP	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
GPIO	PE2	GPIO_Output	Output Open Drain *	No pull-up and no pull-down	Low	LED3
	PE3	GPIO_Output	Output Open Drain *	No pull-up and no pull-down	Low	LED4
	PE0	GPIO_Output	Output Open Drain *	No pull-up and no pull-down	Low	LED1
	PE1	GPIO_Output	Output Open Drain *	No pull-up and no pull-down	Low	LED2

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	0	0
USART1 global interrupt	true	0	0
USART2 global interrupt	true	0	0
USART3 global interrupt	true	0	0
USB On The Go FS global interrupt	true	0	0
USART6 global interrupt	true	0	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
I2C1 event interrupt	unused		
I2C1 error interrupt	unused		
I2C2 event interrupt	unused		
I2C2 error interrupt	unused		
I2C3 event interrupt	unused		
I2C3 error interrupt	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	true
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
USART1 global interrupt	false	true	true
USART2 global interrupt	false	true	true
USART3 global interrupt	false	true	true
USB On The Go FS global interrupt	false	true	true
USART6 global interrupt	false	true	true

* User modified value

9. System Views

9.1. Category view

9.1.1. Current

Middleware

USB_DEVICE ✓

System Core

DMA

GPIO ✓

NVIC ✓

RCC ✓

SYS ✓

Analog

Timers

Connectivity

I2C1 ✓

I2C2 ✓

I2C3 ✓

USART1 ✓

USART2 ✓

USART3 ✓

USART6 ✓

USB_FS ✓

Multimedia

Security

Computing

10. Docs & Resources

Type	Link
Datasheet	http://www.st.com/resource/en/datasheet/DM00213872.pdf
Reference manual	http://www.st.com/resource/en/reference_manual/DM00180369.pdf
Programming manual	http://www.st.com/resource/en/programming_manual/DM00046982.pdf
Errata sheet	http://www.st.com/resource/en/errata_sheet/DM00183231.pdf
Application note	http://www.st.com/resource/en/application_note/CD00167594.pdf
Application note	http://www.st.com/resource/en/application_note/CD00211314.pdf
Application note	http://www.st.com/resource/en/application_note/CD00249778.pdf
Application note	http://www.st.com/resource/en/application_note/CD00259245.pdf
Application note	http://www.st.com/resource/en/application_note/CD00264321.pdf
Application note	http://www.st.com/resource/en/application_note/CD00264342.pdf
Application note	http://www.st.com/resource/en/application_note/CD00264379.pdf
Application note	http://www.st.com/resource/en/application_note/DM00024853.pdf
Application note	http://www.st.com/resource/en/application_note/DM00040802.pdf
Application note	http://www.st.com/resource/en/application_note/DM00040808.pdf
Application note	http://www.st.com/resource/en/application_note/DM00042534.pdf
Application note	http://www.st.com/resource/en/application_note/DM00046011.pdf
Application note	http://www.st.com/resource/en/application_note/DM00072315.pdf
Application note	http://www.st.com/resource/en/application_note/DM00073742.pdf
Application note	http://www.st.com/resource/en/application_note/DM00073853.pdf
Application note	http://www.st.com/resource/en/application_note/DM00080497.pdf
Application note	http://www.st.com/resource/en/application_note/DM00081379.pdf
Application note	http://www.st.com/resource/en/application_note/DM00115714.pdf
Application note	http://www.st.com/resource/en/application_note/DM00129215.pdf
Application note	http://www.st.com/resource/en/application_note/DM00160482.pdf
Application note	http://www.st.com/resource/en/application_note/DM00213525.pdf

Application note http://www.st.com/resource/en/application_note/DM00220769.pdf
Application note http://www.st.com/resource/en/application_note/DM00227538.pdf
Application note http://www.st.com/resource/en/application_note/DM00257177.pdf
Application note http://www.st.com/resource/en/application_note/DM00272912.pdf
Application note http://www.st.com/resource/en/application_note/DM00226326.pdf
Application note http://www.st.com/resource/en/application_note/DM00236305.pdf
Application note http://www.st.com/resource/en/application_note/DM00281138.pdf
Application note http://www.st.com/resource/en/application_note/DM00296349.pdf
Application note http://www.st.com/resource/en/application_note/DM00325582.pdf
Application note http://www.st.com/resource/en/application_note/DM00327191.pdf
Application note http://www.st.com/resource/en/application_note/DM00354244.pdf
Application note http://www.st.com/resource/en/application_note/DM00315319.pdf
Application note http://www.st.com/resource/en/application_note/DM00380469.pdf
Application note http://www.st.com/resource/en/application_note/DM00354333.pdf
Application note http://www.st.com/resource/en/application_note/DM00395696.pdf
Application note http://www.st.com/resource/en/application_note/DM00431633.pdf
Application note http://www.st.com/resource/en/application_note/DM00493651.pdf
Application note http://www.st.com/resource/en/application_note/DM00536349.pdf
Application note http://www.st.com/resource/en/application_note/DM00725181.pdf