1. Description

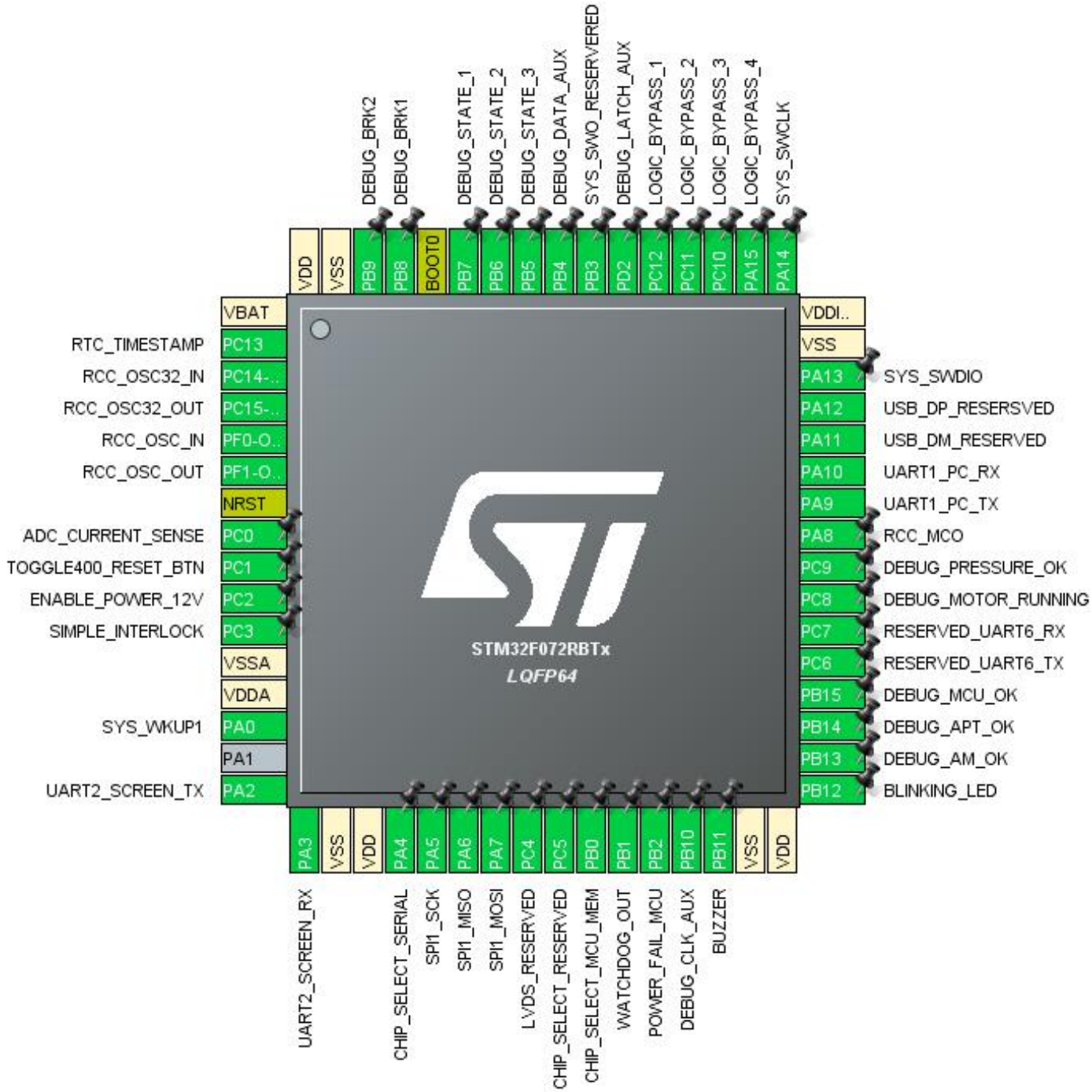
1.1. Project

Project Name	APTX1_1
Board Name	32F072BDISCOVERY
Generated with:	STM32CubeMX 5.3.0
Date	03/11/2020

1.2. MCU

MCU Series	STM32F0
MCU Line	STM32F0x2
MCU name	STM32F072RBTx
MCU Package	LQFP64
MCU Pin number	64

2. Pinout Configuration



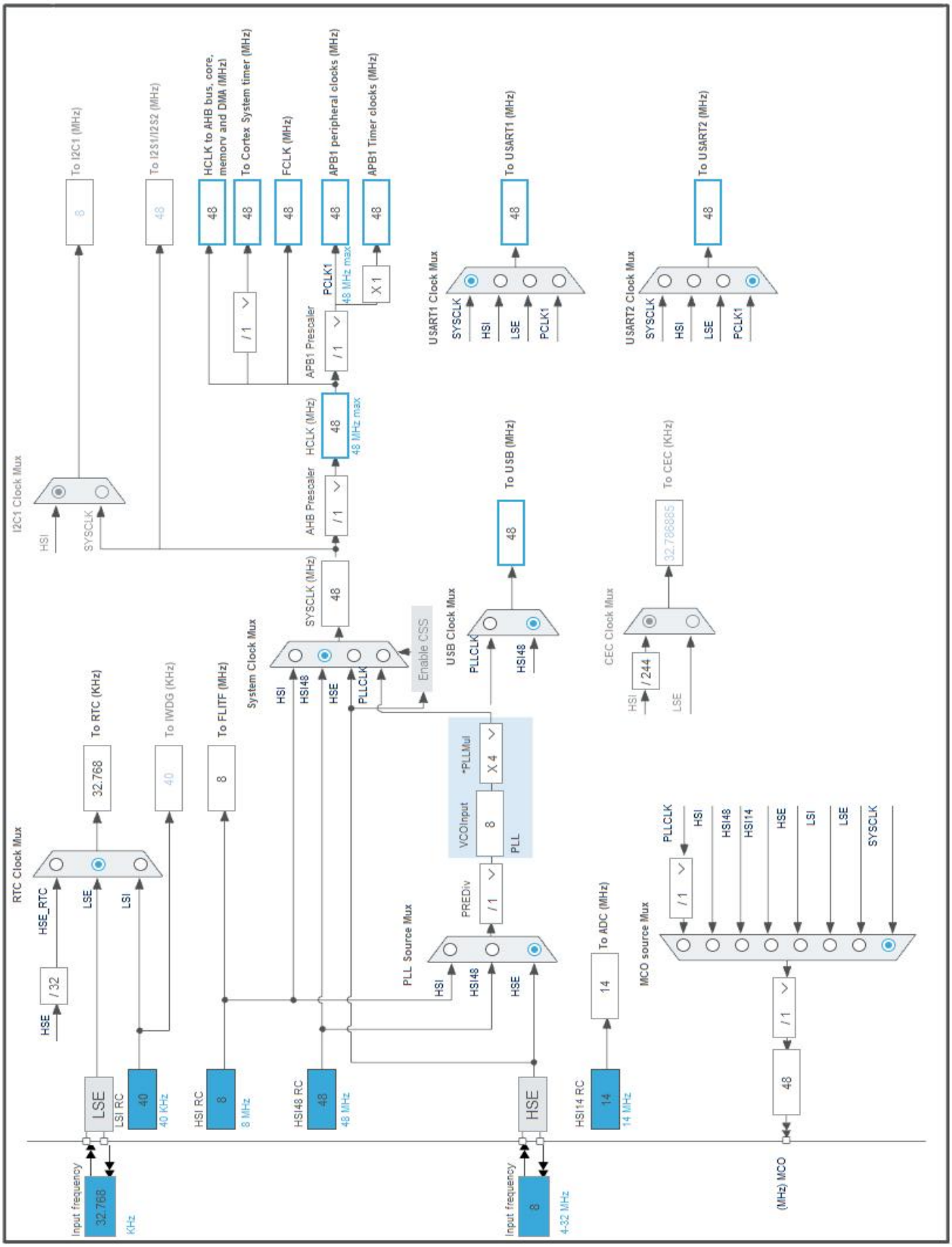
3. Pins Configuration

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
2	PC13	I/O	RTC_TS	RTC_TIMESTAMP
3	PC14-OSC32_IN	I/O	RCC_OSC32_IN	
4	PC15-OSC32_OUT	I/O	RCC_OSC32_OUT	
5	PF0-OSC_IN	I/O	RCC_OSC_IN	
6	PF1-OSC_OUT	I/O	RCC_OSC_OUT	
7	NRST	Reset		
8	PC0	I/O	ADC_IN10	ADC_CURRENT_SENSE
9	PC1 *	I/O	GPIO_Input	TOGGLE400_RESET_BTN
10	PC2 *	I/O	GPIO_Output	ENABLE_POWER_12V
11	PC3 *	I/O	GPIO_Input	SIMPLE_INTERLOCK
12	VSSA	Power		
13	VDDA	Power		
14	PA0	I/O	SYS_WKUP1	
16	PA2	I/O	USART2_TX	UART2_SCREEN_TX
17	PA3	I/O	USART2_RX	UART2_SCREEN_RX
18	VSS	Power		
19	VDD	Power		
20	PA4 *	I/O	GPIO_Output	CHIP_SELECT_SERIAL
21	PA5	I/O	SPI1_SCK	
22	PA6	I/O	SPI1_MISO	
23	PA7	I/O	SPI1_MOSI	
24	PC4 *	I/O	GPIO_Output	LVDS_RESERVED
25	PC5 *	I/O	GPIO_Output	CHIP_SELECT_RESERVED
26	PB0 *	I/O	GPIO_Output	CHIP_SELECT_MCU_MEM
27	PB1 *	I/O	GPIO_Output	WATCHDOG_OUT
28	PB2 *	I/O	GPIO_Input	POWER_FAIL_MCU
29	PB10 *	I/O	GPIO_Output	DEBUG_CLK_AUX
30	PB11 *	I/O	GPIO_Output	BUZZER
31	VSS	Power		
32	VDD	Power		
33	PB12 *	I/O	GPIO_Output	BLINKING_LED
34	PB13 *	I/O	GPIO_Output	DEBUG_AM_OK
35	PB14 *	I/O	GPIO_Output	DEBUG_APT_OK
36	PB15 *	I/O	GPIO_Output	DEBUG_MCU_OK

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
37	PC6 *	I/O	GPIO_Output	RESERVED_UART6_TX
38	PC7 *	I/O	GPIO_Output	RESERVED_UART6_RX
39	PC8 *	I/O	GPIO_Output	DEBUG_MOTOR_RUNNING
40	PC9 *	I/O	GPIO_Output	DEBUG_PRESSURE_OK
41	PA8	I/O	RCC_MCO	
42	PA9	I/O	USART1_TX	UART1_PC_TX
43	PA10	I/O	USART1_RX	UART1_PC_RX
44	PA11	I/O	USB_DM	USB_DM_RESERVED
45	PA12	I/O	USB_DP	USB_DP_RESERSVED
46	PA13	I/O	SYS_SWDIO	
47	VSS	Power		
48	VDDIO2	Power		
49	PA14	I/O	SYS_SWCLK	
50	PA15 *	I/O	GPIO_Input	LOGIC_BYPASS_4
51	PC10 *	I/O	GPIO_Input	LOGIC_BYPASS_3
52	PC11 *	I/O	GPIO_Input	LOGIC_BYPASS_2
53	PC12 *	I/O	GPIO_Input	LOGIC_BYPASS_1
54	PD2 *	I/O	GPIO_Output	DEBUG_LATCH_AUX
55	PB3 *	I/O	GPIO_Output	SYS_SWO_RESERVERED
56	PB4 *	I/O	GPIO_Output	DEBUG_DATA_AUX
57	PB5 *	I/O	GPIO_Output	DEBUG_STATE_3
58	PB6 *	I/O	GPIO_Output	DEBUG_STATE_2
59	PB7 *	I/O	GPIO_Output	DEBUG_STATE_1
60	BOOT0	Boot		
61	PB8 *	I/O	GPIO_Output	DEBUG_BRK1
62	PB9 *	I/O	GPIO_Output	DEBUG_BRK2
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	APTX1_1
Project Folder	C:\Users\nicko\source\repos\APTX1_1
Toolchain / IDE	MDK-ARM V5
Firmware Package Name and Version	STM32Cube FW_F0 V1.10.1

5.2. Code Generation Settings

Name	Value
STM32Cube MCU packages and embedded software	Copy all used libraries into the project folder
Generate peripheral initialization as a pair of '.c/.h' files	Yes
Backup previously generated files when re-generating	No
Delete previously generated files when not re-generated	Yes
Set all free pins as analog (to optimize the power consumption)	No

6. Power Consumption Calculator report

6.1. Microcontroller Selection

Series	STM32F0
Line	STM32F0x2
MCU	STM32F072RBTx
Datasheet	025004_Rev5

6.2. Parameter Selection

Temperature	25
Vdd	3.6

7. IPs and Middleware Configuration

7.1. ADC

mode: IN10

mode: Temperature Sensor Channel

mode: Vrefint Channel

mode: Vbat Channel

7.1.1. Parameter Settings:

ADC_Settings:

Clock Prescaler	Asynchronous clock mode
Resolution	**ADC 10-bit resolution ***
Data Alignment	Right alignment
Scan Conversion Mode	Forward
Continuous Conversion Mode	**Enabled ***
Discontinuous Conversion Mode	Disabled
DMA Continuous Requests	**Enabled ***
End Of Conversion Selection	**End of sequence of conversion ***
Overrun behaviour	**Overrun data overwritten ***
Low Power Auto Wait	Disabled
Low Power Auto Power Off	Disabled

ADC_Regular_ConversionMode:

Sampling Time	**239.5 Cycles ***
External Trigger Conversion Source	Regular Conversion launched by software
External Trigger Conversion Edge	None

WatchDog:

Enable Analog WatchDog Mode	false

7.2. CRC

mode: Activated

7.2.1. Parameter Settings:

Basic Parameters:

Default Polynomial State	Enable
Default Init Value State	Enable

Advanced Parameters:

Input Data Inversion Mode	None

Output Data Inversion Mode	Disable
Input Data Format	Bytes

7.3. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

Low Speed Clock (LSE) : Crystal/Ceramic Resonator

mode: Master Clock Output

7.3.1. Parameter Settings:

System Parameters:

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

RCC Parameters:

HSI14 Calibration Value	16
HSE Startup Timout Value (ms)	100
LSE Startup Timout Value (ms)	5000
LSE Drive Capability	LSE oscillator high drive capability

7.4. RTC

mode: Activate Clock Source

mode: Activate Calendar

mode: Timestamp

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

Time Stamp:

Time Stamp Pin Edge	Time Stamp occurs on the Rising edge

7.5. SPI1

Mode: Full-Duplex Master

7.5.1. Parameter Settings:

Basic Parameters:

Frame Format	Motorola
Data Size	**8 Bits ***
First Bit	MSB First

Clock Parameters:

Prescaler (for Baud Rate)	**32 ***
Baud Rate	**1.5 MBits/s ***
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSSP Mode	**Disabled ***
NSS Signal Type	Software

7.6. SYS

mode: Debug Serial Wire

mode: System Wake-Up 1

Timebase Source: TIM1

7.7. TIM3

Clock Source : Internal Clock

7.7.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**21 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**100 ***
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)

7.8. TIM15

mode: Clock Source

7.8.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**12 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**440 ***
Internal Clock Division (CKD)	No Division
Repetition Counter (RCR - 8 bits value)	0
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)

7.9. TIM16

mode: Activated

Channel1: PWM Generation No Output

7.9.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**960 ***
Counter Mode	Up
Counter Period (AutoReload Register -	

16 bits value)	**100 ***
Internal Clock Division (CKD)	No Division
Repetition Counter (RCR - 8 bits value)	0
auto-reload preload	Disable

Break And Dead Time management - BRK Configuration:

BRK State	Disable
BRK Polarity	High

Break And Dead Time management - Output Configuration:

Automatic Output State	Disable
Off State Selection for Run Mode (OSSR)	Disable
Off State Selection for Idle Mode (OSSI)	Disable
Lock Configuration	Off

PWM Generation Channel 1:

Mode	PWM mode 1
Pulse (16 bits value)	0
Fast Mode	Disable
CH Polarity	High
CH Idle State	Reset

7.10. USART1

Mode: Asynchronous

7.10.1. 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
Single Sample	Disable

Advanced Features:

Auto Baudrate	Disable
TX Pin Active Level Inversion	Disable
RX Pin Active Level Inversion	Disable
Data Inversion	Disable
TX and RX Pins Swapping	Disable

Overrun	Enable
DMA on RX Error	Enable
MSB First	Disable

7.11. USART2

Mode: Asynchronous

7.11.1. Parameter Settings:

Basic Parameters:

Baud Rate	38400
Word Length	8 Bits (including Parity)
Parity	None
Stop Bits	1

Advanced Parameters:

Data Direction	Receive and Transmit
Over Sampling	16 Samples
Single Sample	Disable

Advanced Features:

Auto Baudrate	Disable
TX Pin Active Level Inversion	Disable
RX Pin Active Level Inversion	Disable
Data Inversion	Disable
TX and RX Pins Swapping	Disable
Overrun	Enable
DMA on RX Error	Enable
MSB First	Disable

7.12. USB

mode: Device (FS)

7.12.1. Parameter Settings:

Basic Parameters:

Speed	Full Speed 12MBit/s
Physical interface	Internal Phy

Power Parameters:

Low Power	Disabled
Link Power Management	Disabled

7.13. USB_DEVICE

Class For FS IP: Download Firmware Update Class (DFU)

7.13.1. 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_SUPPORT_USER_STRING (Enable user string descriptor)	Enabled
USBD_SELF_POWERED (Enabled self power)	Enabled
USBD_DEBUG_LEVEL (USBD Debug Level)	0: No debug message

Class Parameters:

USBD_DFU_MAX_ITF_NUM (DFU maximum interface numbers)	1
USBD_DFU_XFER_SIZE	1024
USBD_DFU_APP_DEFAULT_ADD (Base Address 0x)	**0x08000000 ***
USBD_DFU_MEDIA Interface	@Internal Flash /0x08000000/03*016Ka,01*016Kg,01*064Kg,07*128Kg,04*0

7.13.2. 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)	57105
PRODUCT_STRING (Product Identifier)	STM32 DownLoad Firmware Update
CONFIGURATION_STRING (Configuration Identifier)	DFU Config
INTERFACE_STRING (Interface Identifier)	DFU 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
ADC	PC0	ADC_IN10	Analog mode	No pull-up and no pull-down	n/a	ADC_CURRENT_SENSE
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	
	PF0-OSC_IN	RCC_OSC_IN	n/a	n/a	n/a	
	PF1-OSC_OUT	RCC_OSC_OUT	n/a	n/a	n/a	
	PA8	RCC_MCO	Alternate Function Push Pull	No pull-up and no pull-down	Low	
RTC	PC13	RTC_TS	n/a	n/a	n/a	RTC_TIMESTAMP
SPI1	PA5	SPI1_SCK	Alternate Function Push Pull	No pull-up and no pull-down	**High ***	
	PA6	SPI1_MISO	Alternate Function Push Pull	**Pull-up ***	**High ***	
	PA7	SPI1_MOSI	Alternate Function Push Pull	**Pull-up ***	**High ***	
SYS	PA0	SYS_WKUP1	n/a	n/a	n/a	
	PA13	SYS_SWDIO	n/a	n/a	n/a	
	PA14	SYS_SWCLK	n/a	n/a	n/a	
USART1	PA9	USART1_TX	Alternate Function Push Pull	No pull-up and no pull-down	**High ***	UART1_PC_TX
	PA10	USART1_RX	Alternate Function Push Pull	No pull-up and no pull-down	**High ***	UART1_PC_RX
USART2	PA2	USART2_TX	Alternate Function Push Pull	No pull-up and no pull-down	**High ***	UART2_SCREEN_TX
	PA3	USART2_RX	Alternate Function Push Pull	No pull-up and no pull-down	**High ***	UART2_SCREEN_RX
USB	PA11	USB_DM	n/a	n/a	n/a	USB_DM_RESERVED
	PA12	USB_DP	n/a	n/a	n/a	USB_DP_RESERSV

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
						ED
GPIO	PC1	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	TOGGLE400_RESET_BTN
	PC2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ENABLE_POWER_12V
	PC3	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	SIMPLE_INTERLOCK
	PA4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	CHIP_SELECT_SERIAL
	PC4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LVDS_RESERVED
	PC5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	CHIP_SELECT_RESERVED
	PB0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	CHIP_SELECT_MCU_MEM
	PB1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	WATCHDOG_OUT
	PB2	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	POWER_FAIL_MCU
	PB10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DEBUG_CLK_AUX
	PB11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	BUZZER
	PB12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	BLINKING_LED
	PB13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DEBUG_AM_OK
	PB14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DEBUG_APT_OK
	PB15	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DEBUG_MCU_OK
	PC6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RESERVED_UART6_TX
	PC7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RESERVED_UART6_RX
	PC8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DEBUG_MOTOR_RUNNING
	PC9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DEBUG_PRESSURE_OK
	PA15	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	LOGIC_BYPASS_4
	PC10	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	LOGIC_BYPASS_3

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PC11	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	LOGIC_BYPASS_2
	PC12	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	LOGIC_BYPASS_1
	PD2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DEBUG_LATCH_AUX
	PB3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	SYS_SWO_RESERVERED
	PB4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DEBUG_DATA_AUX
	PB5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DEBUG_STATE_3
	PB6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DEBUG_STATE_2
	PB7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DEBUG_STATE_1
	PB8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DEBUG_BRK1
	PB9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DEBUG_BRK2

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
System service call via SWI instruction	true	0	0
Pendable request for system service	true	0	0
System tick timer	true	0	0
TIM1 break, update, trigger and commutation interrupts	true	0	0
TIM16 global interrupt	true	0	0
USART1 global interrupt / USART1 wake-up interrupt through EXTI line 25	true	3	0
USB global interrupt / USB wake-up interrupt through EXTI line 18	true	0	0
PVD and VDDIO2 supply comparator interrupts through EXTI lines 16 and 31	unused		
RTC global interrupt through EXTI lines 17, 19 and 20	unused		
Flash global interrupt	unused		
RCC and CRS global interrupts	unused		
ADC and COMP interrupts (COMP interrupts through EXTI lines 21 and 22)	unused		
TIM3 global interrupt	unused		
TIM15 global interrupt	unused		
SPI1 global interrupt	unused		
USART2 global interrupt / USART2 wake-up interrupt through EXTI line 26	unused		

*** User modified value**

9. Software Pack Report