

## 1. Description

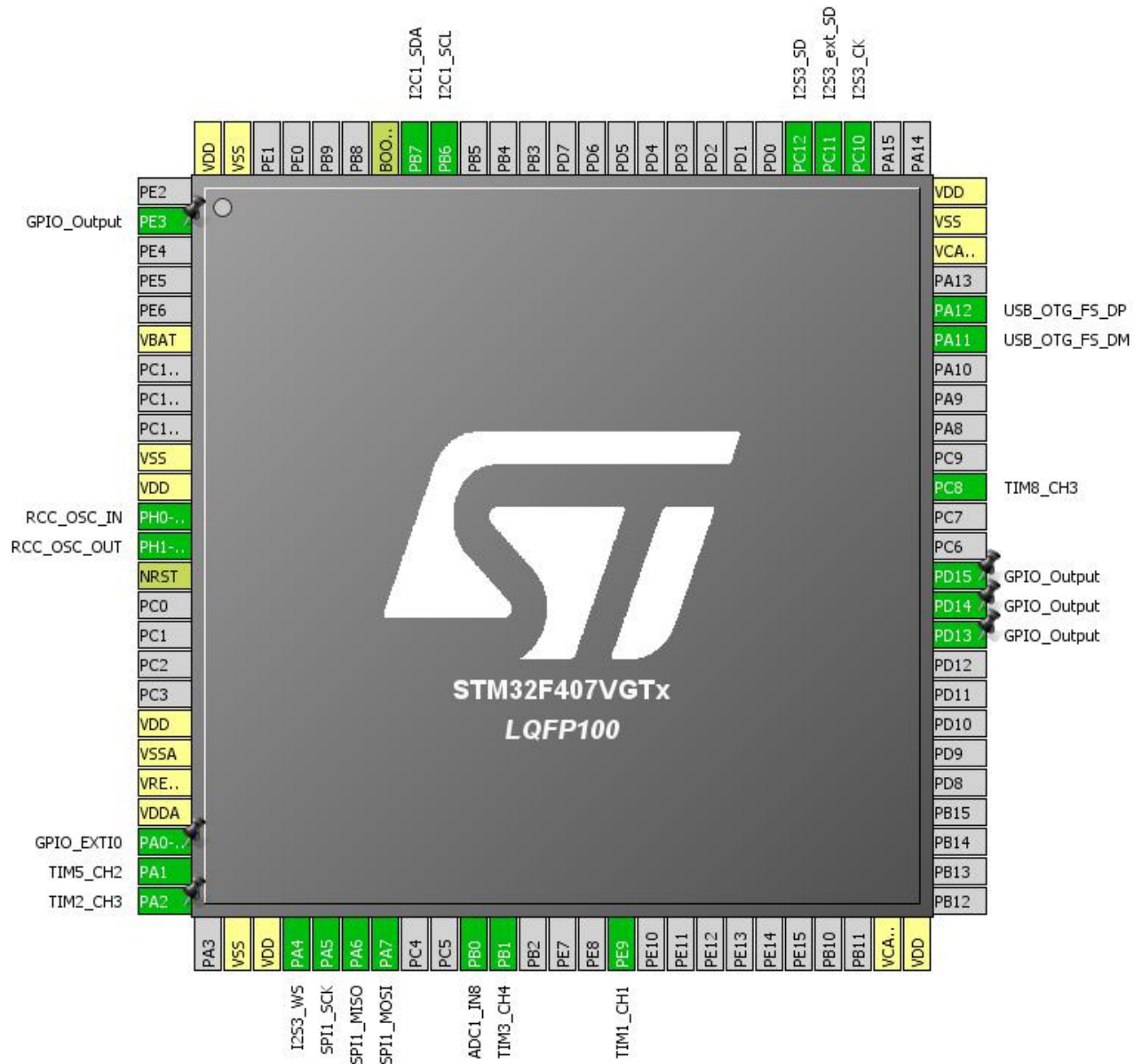
### 1.1. Project

Project Name	Projekt1
Board Name	STM32F4DISCOVERY
Generated with:	STM32CubeMX 4.22.1
Date	08/25/2018

### 1.2. MCU

MCU Series	STM32F4
MCU Line	STM32F407/417
MCU name	STM32F407VGTx
MCU Package	LQFP100
MCU Pin number	100

## 2. Pinout Configuration



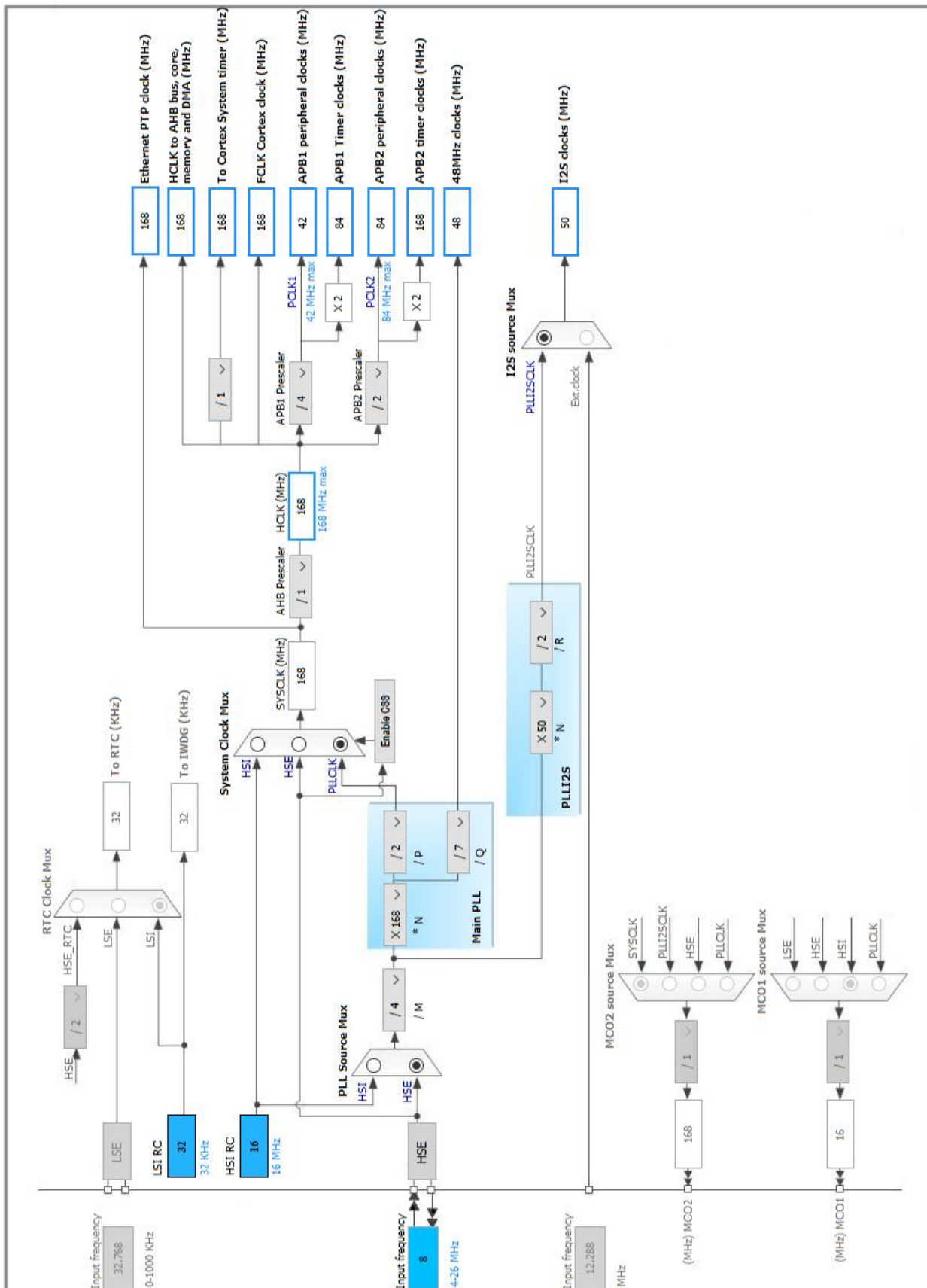
### 3. Pins Configuration

Pin Number LQFP100	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
2	PE3 *	I/O	GPIO_Output	
6	VBAT	Power		
10	VSS	Power		
11	VDD	Power		
12	PH0-OSC_IN	I/O	RCC_OSC_IN	
13	PH1-OSC_OUT	I/O	RCC_OSC_OUT	
14	NRST	Reset		
19	VDD	Power		
20	VSSA	Power		
21	VREF+	Power		
22	VDDA	Power		
23	PA0-WKUP	I/O	GPIO_EXTI0	
24	PA1	I/O	TIM5_CH2	
25	PA2	I/O	TIM2_CH3	
27	VSS	Power		
28	VDD	Power		
29	PA4	I/O	I2S3_WS	
30	PA5	I/O	SPI1_SCK	
31	PA6	I/O	SPI1_MISO	
32	PA7	I/O	SPI1_MOSI	
35	PB0	I/O	ADC1_IN8	
36	PB1	I/O	TIM3_CH4	
40	PE9	I/O	TIM1_CH1	
49	VCAP_1	Power		
50	VDD	Power		
60	PD13 *	I/O	GPIO_Output	
61	PD14 *	I/O	GPIO_Output	
62	PD15 *	I/O	GPIO_Output	
65	PC8	I/O	TIM8_CH3	
70	PA11	I/O	USB_OTG_FS_DM	
71	PA12	I/O	USB_OTG_FS_DP	
73	VCAP_2	Power		
74	VSS	Power		
75	VDD	Power		
78	PC10	I/O	I2S3_CK	
79	PC11	I/O	I2S3_ext_SD	

Pin Number LQFP100	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
80	PC12	I/O	I2S3_SD	
92	PB6	I/O	I2C1_SCL	
93	PB7	I/O	I2C1_SDA	
94	BOOT0	Boot		
99	VSS	Power		
100	VDD	Power		

\* The pin is affected with an I/O function

## 4. Clock Tree Configuration



## 5. IPs and Middleware Configuration

### 5.1. ADC1

mode: IN8

#### 5.1.1. Parameter Settings:

##### ADCs\_Common\_Settings:

Mode Independent mode

##### ADC\_Settings:

Clock Prescaler PCLK2 divided by 4

Resolution **8 bits (11 ADC Clock cycles) \***

Data Alignment Right alignment

Scan Conversion Mode **Enabled \***

Continuous Conversion Mode Disabled

Discontinuous Conversion Mode Disabled

DMA Continuous Requests **Enabled \***

End Of Conversion Selection EOC flag at the end of single channel conversion

##### ADC\_Regular\_ConversionMode:

Number Of Conversion 1

External Trigger Conversion Source **Timer 8 Trigger Out event \***

External Trigger Conversion Edge Trigger detection on the rising edge

Rank 1

Channel Channel 8

Sampling Time **28 Cycles \***

##### ADC\_Injected\_ConversionMode:

Number Of Conversions 0

##### WatchDog:

Enable Analog WatchDog Mode false

### 5.2. I2C1

I2C: I2C

#### 5.2.1. 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

## 5.3. I2S3

### Mode: Full-Duplex Master

#### 5.3.1. Parameter Settings:

**Generic Parameters:**

Transmission Mode	Mode Master Transmit
Communication Standard	I2S Philips
Data and Frame Format	16 Bits Data on 16 Bits Frame
Selected Audio Frequency	8 KHz
Real Audio Frequency	<b>8.012 KHz *</b>
Error between Selected and Real	<b>0.15 % *</b>

**Clock Parameters:**

Clock Source	I2S PLL Clock
Clock Polarity	Low

## 5.4. RCC

### High Speed Clock (HSE): Crystal/Ceramic Resonator

#### 5.4.1. Parameter Settings:

**System Parameters:**

VDD voltage (V)	3.3
Instruction Cache	Enabled
Prefetch Buffer	Enabled

Data Cache	Enabled
Flash Latency(WS)	5 WS (6 CPU cycle)
<b>RCC Parameters:</b>	
HSI Calibration Value	16
HSE Startup Timeout Value (ms)	100
LSE Startup Timeout Value (ms)	5000
<b>Power Parameters:</b>	
Power Regulatror Voltage Scale	Power Regulator Voltage Scale 1

## 5.5. SPI1

**Mode: Full-Duplex Master**

### 5.5.1. Parameter Settings:

#### Basic Parameters:

Frame Format	Motorola
Data Size	8 Bits
First Bit	MSB First

#### Clock Parameters:

Prescaler (for Baud Rate)	2
Baud Rate	<b>42.0 MBits/s *</b>
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

#### Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

## 5.6. SYS

**Timebase Source: SysTick**

## 5.7. TIM1

**Clock Source : Internal Clock**  
**Channel1: PWM Generation CH1**

### 5.7.1. Parameter Settings:



#### Counter Settings:

Prescaler (PSC - 16 bits value)	<b>84 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value )	<b>15000 *</b>
Internal Clock Division (CKD)	No Division
Repetition Counter (RCR - 8 bits value)	0

#### Trigger Output (TRGO) Parameters:

Master/Slave Mode	Disable (no sync between this TIM (Master) and its Slaves)
Trigger Event Selection	<b>Output Compare (OC1REF) *</b>

#### 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)	<b>5*2 *</b>
Fast Mode	Disable
CH Polarity	High
CH Idle State	Reset

## 5.8. TIM2

**Clock Source : Internal Clock**

**Channel3: PWM Generation CH3**

### 5.8.1. Parameter Settings:

#### Counter Settings:

Prescaler (PSC - 16 bits value)	<b>42 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 32 bits value )	<b>40 *</b>
Internal Clock Division (CKD)	No Division

#### Trigger Output (TRGO) Parameters:

Master/Slave Mode	Disable (no sync between this TIM (Master) and its Slaves)
Trigger Event Selection	Reset (UG bit from TIMx_EGR)

#### **PWM Generation Channel 3:**

Mode	PWM mode 1
Pulse (32 bits value)	<b>2*2 *</b>
Fast Mode	Disable
CH Polarity	<b>Low *</b>

### **5.9. TIM3**

**Clock Source : Internal Clock**

**Channel4: PWM Generation CH4**

#### **5.9.1. Parameter Settings:**

##### **Counter Settings:**

Prescaler (PSC - 16 bits value)	<b>21 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value )	<b>1 *</b>
Internal Clock Division (CKD)	No Division

##### **Trigger Output (TRGO) Parameters:**

Master/Slave Mode	Disable (no sync between this TIM (Master) and its Slaves)
Trigger Event Selection	Reset (UG bit from TIMx_EGR)

#### **PWM Generation Channel 4:**

Mode	PWM mode 1
Pulse (16 bits value)	<b>1 *</b>
Fast Mode	Disable
CH Polarity	High

### **5.10. TIM5**

**mode: Clock Source**

**Channel2: PWM Generation CH2**

#### **5.10.1. Parameter Settings:**

##### **Counter Settings:**

Prescaler (PSC - 16 bits value)	<b>42 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 32 bits value )	<b>(2*15000)-1 *</b>
Internal Clock Division (CKD)	No Division

#### Trigger Output (TRGO) Parameters:

Master/Slave Mode	<b>Enable (sync between this TIM (Master) and its Slaves (through TRGO)) *</b>
Trigger Event Selection	<b>Update Event *</b>

#### PWM Generation Channel 2:

Mode	PWM mode 1
Pulse (32 bits value)	<b>20*2 *</b>
Fast Mode	Disable
CH Polarity	High

## 5.11. TIM8

**Clock Source : Internal Clock**  
**Channel3: PWM Generation CH3**

### 5.11.1. Parameter Settings:

#### Counter Settings:

Prescaler (PSC - 16 bits value)	<b>350 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value )	<b>1 *</b>
Internal Clock Division (CKD)	No Division
Repetition Counter (RCR - 8 bits value)	0

#### Trigger Output (TRGO) Parameters:

Master/Slave Mode	Disable (no sync between this TIM (Master) and its Slaves
Trigger Event Selection	<b>Update Event *</b>

#### 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 3:

Mode	PWM mode 1
Pulse (16 bits value)	<b>1</b> *
Fast Mode	Disable
CH Polarity	High
CH Idle State	Reset

## 5.12. USB\_OTG\_FS

### Mode: Device\_Only

#### 5.12.1. Parameter Settings:

Speed	Device Full Speed 12MBit/s
Endpoint 0 Max Packet size	64 Bytes
Enable internal IP DMA	Disabled
Low power	Disabled
Link Power Management	Disabled
VBUS sensing	Enabled
Signal start of frame	Disabled

## 5.13. USB\_DEVICE

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

#### 5.13.1. 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)	Disabled
USBD_SELF_POWERED (Enabled self power)	Enabled
USBD_DEBUG_LEVEL (USBD Debug Level)	0: No debug message

##### Class Parameters:

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

### 5.13.2. 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)	22336
PRODUCT_STRING (Product Identifier)	STM32 Virtual ComPort
SERIALNUMBER_STRING (Serial number)	00000000001A
CONFIGURATION_STRING (Configuration Identifier)	CDC Config
INTERFACE_STRING (Interface Identifier)	CDC Interface

\* User modified value

## 6. System Configuration

### 6.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
ADC1	PB0	ADC1_IN8	Analog mode	No pull-up and no pull-down	n/a	
I2C1	PB6	I2C1_SCL	Alternate Function Open Drain	Pull-up	<b>Very High</b> *	
	PB7	I2C1_SDA	Alternate Function Open Drain	Pull-up	<b>Very High</b> *	
I2S3	PA4	I2S3_WS	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PC10	I2S3_CK	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PC11	I2S3_ext_SD	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PC12	I2S3_SD	Alternate Function Push Pull	No pull-up and no pull-down	Low	
RCC	PH0-OSC_IN	RCC_OSC_IN	n/a	n/a	n/a	
	PH1-OSC_OUT	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> *	
TIM1	PE9	TIM1_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
TIM2	PA2	TIM2_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	
TIM3	PB1	TIM3_CH4	Alternate Function Push Pull	No pull-up and no pull-down	Low	
TIM5	PA1	TIM5_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	
TIM8	PC8	TIM8_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	
USB_OTG_FS	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	PE3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PA0-WKUP	GPIO_EXTI0	<b>External Interrupt Mode with Falling edge trigger detection</b>	No pull-up and no pull-down	n/a	
	PD13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PD14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PD15	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	

## 6.2. DMA configuration

DMA request	Stream	Direction	Priority
ADC1	DMA2_Stream0	Peripheral To Memory	Low

### ADC1: DMA2\_Stream0 DMA request Settings:

Mode: **Circular \***  
Use fifo: Disable  
Peripheral Increment: Disable  
Memory Increment: **Enable \***  
Peripheral Data Width: **Byte \***  
Memory Data Width: **Byte \***



### 6.3. 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
RCC global interrupt	true	0	0
EXTI line0 interrupt	true	0	0
ADC1, ADC2 and ADC3 global interrupts	true	0	0
TIM1 break interrupt and TIM9 global interrupt	true	0	0
TIM1 update interrupt and TIM10 global interrupt	true	0	0
TIM1 trigger and commutation interrupts and TIM11 global interrupt	true	0	0
TIM1 capture compare interrupt	true	0	0
TIM2 global interrupt	true	0	0
TIM3 global interrupt	true	0	0
TIM8 break interrupt and TIM12 global interrupt	true	0	0
TIM8 update interrupt and TIM13 global interrupt	true	0	0
TIM8 trigger and commutation interrupts and TIM14 global interrupt	true	0	0
TIM8 capture compare interrupt	true	0	0
TIM5 global interrupt	true	0	0
DMA2 stream0 global interrupt	true	0	0
USB On The Go FS global interrupt	true	0	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
I2C1 event interrupt	unused		
I2C1 error interrupt	unused		
SPI1 global interrupt	unused		
SPI3 global interrupt	unused		
FPU global interrupt	unused		

\* User modified value

## ***7. Power Consumption Calculator report***

### 7.1. Microcontroller Selection

Series	STM32F4
Line	STM32F407/417
MCU	STM32F407VGTx
Datasheet	022152_Rev8

### 7.2. Parameter Selection

Temperature	25
Vdd	3.3

## 8. Software Project

### 8.1. Project Settings

Name	Value
Project Name	Projekt1
Project Folder	C:\Users\Janicka\Documents\STM_projekty\experiment3_zalohaTvariSeZeToDel
Toolchain / IDE	MDK-ARM V5
Firmware Package Name and Version	STM32Cube FW_F4 V1.16.0

### 8.2. Code Generation Settings

Name	Value
STM32Cube Firmware Library Package	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
Delete previously generated files when not re-generated	Yes
Set all free pins as analog (to optimize the power consumption)	No