

## 1. Description

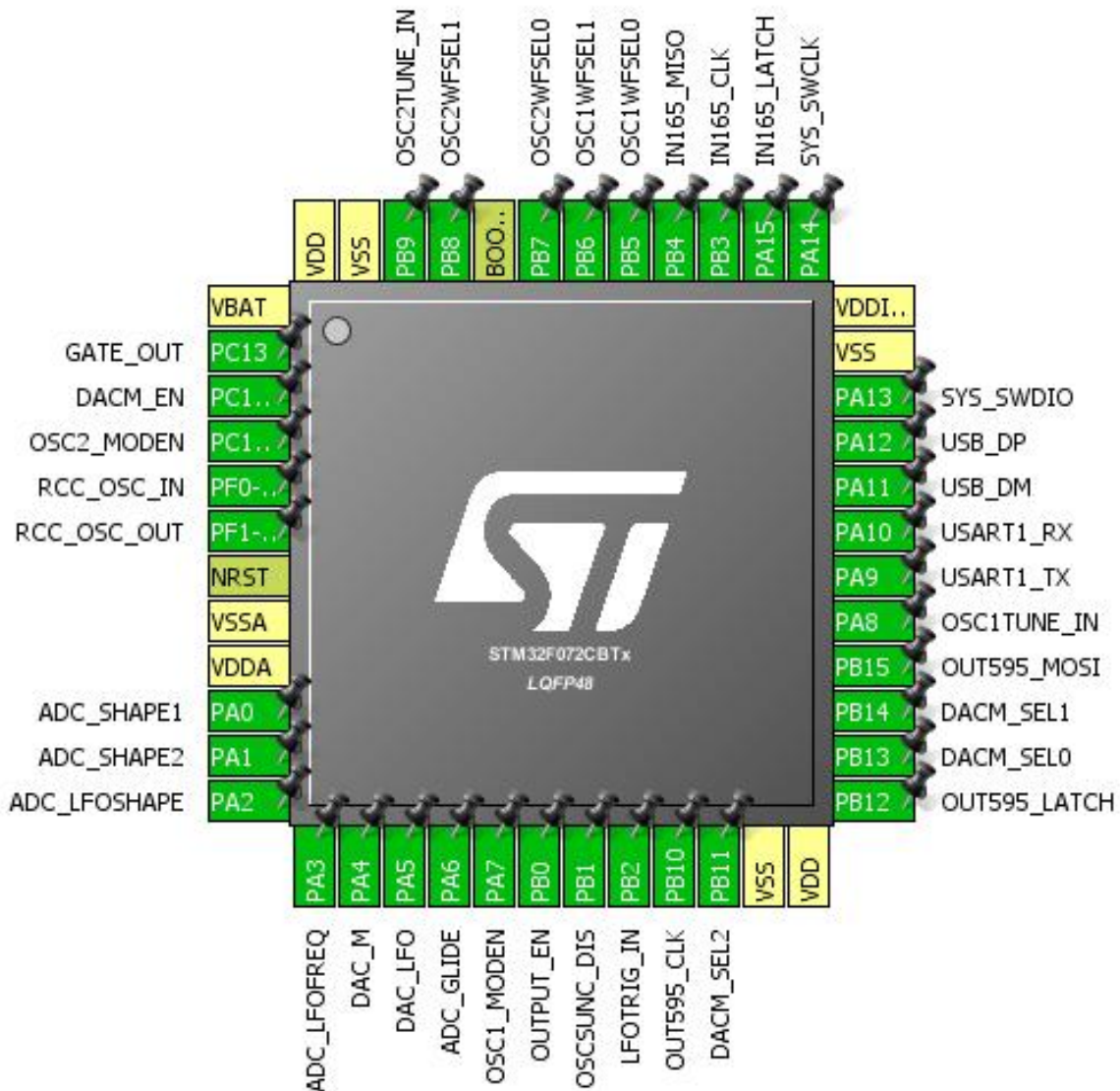
### 1.1. Project

Project Name	neutr_cube
Board Name	custom
Generated with:	STM32CubeMX 4.27.0
Date	11/28/2018

### 1.2. MCU

MCU Series	STM32F0
MCU Line	STM32F0x2
MCU name	STM32F072CBTx
MCU Package	LQFP48
MCU Pin number	48

## 2. Pinout Configuration



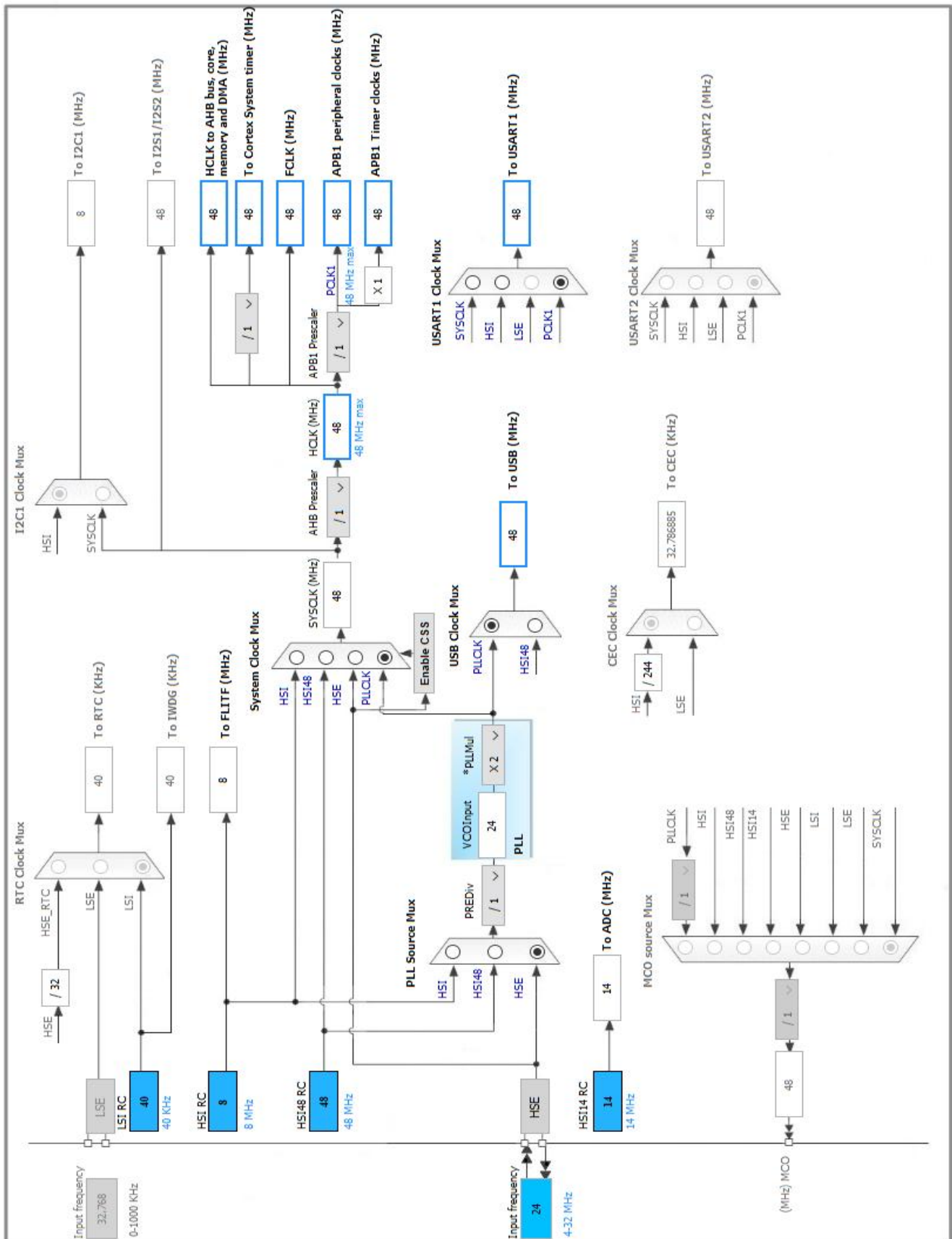
### 3. Pins Configuration

Pin Number LQFP48	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
2	PC13 *	I/O	GPIO_Output	GATE_OUT
3	PC14-OSC32_IN *	I/O	GPIO_Output	DACM_EN
4	PC15-OSC32_OUT *	I/O	GPIO_Output	OSC2_MODEN
5	PF0-OSC_IN	I/O	RCC_OSC_IN	
6	PF1-OSC_OUT	I/O	RCC_OSC_OUT	
7	NRST	Reset		
8	VSSA	Power		
9	VDDA	Power		
10	PA0	I/O	ADC_IN0	ADC_SHAPE1
11	PA1	I/O	ADC_IN1	ADC_SHAPE2
12	PA2	I/O	ADC_IN2	ADC_LFOSHAPE
13	PA3	I/O	ADC_IN3	ADC_LFOFREQ
14	PA4	I/O	DAC_OUT1	DAC_M
15	PA5	I/O	DAC_OUT2	DAC_LFO
16	PA6	I/O	ADC_IN6	ADC_GLIDE
17	PA7 *	I/O	GPIO_Output	OSC1_MODEN
18	PB0 *	I/O	GPIO_Output	OUTPUT_EN
19	PB1 *	I/O	GPIO_Output	OSCSUNC_DIS
20	PB2 *	I/O	GPIO_Input	LFOTRIG_IN
21	PB10	I/O	SPI2_SCK	OUT595_CLK
22	PB11 *	I/O	GPIO_Output	DACM_SEL2
23	VSS	Power		
24	VDD	Power		
25	PB12 *	I/O	GPIO_Output	OUT595_LATCH
26	PB13 *	I/O	GPIO_Output	DACM_SEL0
27	PB14 *	I/O	GPIO_Output	DACM_SEL1
28	PB15	I/O	SPI2_MOSI	OUT595_MOSI
29	PA8	I/O	TIM1_CH1	OSC1TUNE_IN
30	PA9	I/O	USART1_TX	
31	PA10	I/O	USART1_RX	
32	PA11	I/O	USB_DM	
33	PA12	I/O	USB_DP	
34	PA13	I/O	SYS_SWDIO	
35	VSS	Power		
36	VDDIO2	Power		

Pin Number LQFP48	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
37	PA14	I/O	SYS_SWCLK	
38	PA15 *	I/O	GPIO_Output	IN165_LATCH
39	PB3	I/O	SPI1_SCK	IN165_CLK
40	PB4	I/O	SPI1_MISO	IN165_MISO
41	PB5 *	I/O	GPIO_Output	OSC1WFSEL0
42	PB6 *	I/O	GPIO_Output	OSC1WFSEL1
43	PB7 *	I/O	GPIO_Output	OSC2WFSEL0
44	BOOT0	Boot		
45	PB8 *	I/O	GPIO_Output	OSC2WFSEL1
46	PB9	I/O	TIM17_CH1	OSC2TUNE_IN
47	VSS	Power		
48	VDD	Power		

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

## 4. Clock Tree Configuration



## 5. IPs and Middleware Configuration

### 5.1. ADC

mode: IN0

mode: IN1

mode: IN2

mode: IN3

mode: IN6

#### 5.1.1. Parameter Settings:

##### ADC\_Settings:

Clock Prescaler	Asynchronous clock mode
Resolution	ADC 12-bit resolution
Data Alignment	Right alignment
Scan Conversion Mode	Forward
Continuous Conversion Mode	Disabled
Discontinuous Conversion Mode	Disabled
DMA Continuous Requests	Disabled
End Of Conversion Selection	End of single conversion
Overrun behaviour	Overrun data preserved
Low Power Auto Wait	Disabled
Low Power Auto Power Off	Disabled

##### ADC\_Regular\_ConversionMode:

Sampling Time	<b>28.5 Cycles *</b>
External Trigger Conversion Source	Regular Conversion launched by software
External Trigger Conversion Edge	None

##### WatchDog:

Enable Analog WatchDog Mode	false
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### 5.2. DAC

mode: OUT1 Configuration

mode: OUT2 Configuration

#### 5.2.1. Parameter Settings:

##### DAC Out1 Settings:

Output Buffer	Enable
Trigger	None

##### DAC Out2 Settings:

Output Buffer	Enable
Trigger	<b>Timer 6 Trigger Out event *</b>
Wave generation mode	Disabled

### 5.3. RCC

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

##### 5.3.1. 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 Timeout Value (ms)	100
LSE Startup Timeout Value (ms)	5000

### 5.4. SPI1

#### Mode: Receive Only Master

##### 5.4.1. Parameter Settings:

###### Basic Parameters:

Frame Format	Motorola
Data Size	<b>16 Bits *</b>
First Bit	MSB First

###### Clock Parameters:

Prescaler (for Baud Rate)	<b>16 *</b>
Baud Rate	<b>3.0 MBits/s *</b>
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

###### Advanced Parameters:

CRC Calculation	Disabled
NSSP Mode	Enabled
NSS Signal Type	Software

## 5.5. SPI2

**Mode: Transmit Only Master**

### 5.5.1. Parameter Settings:

#### Basic Parameters:

Frame Format	Motorola
Data Size	<b>16 Bits *</b>
First Bit	MSB First

#### Clock Parameters:

Prescaler (for Baud Rate)	<b>16 *</b>
Baud Rate	<b>3.0 MBits/s *</b>
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

#### Advanced Parameters:

CRC Calculation	Disabled
NSSP Mode	Enabled
NSS Signal Type	Software

## 5.6. SYS

**mode: Debug Serial Wire**

**Timebase Source: SysTick**

## 5.7. TIM1

**Channel1: Input Capture direct mode**

### 5.7.1. Parameter Settings:

#### Counter Settings:

Prescaler (PSC - 16 bits value)	<b>512 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value )	0
Internal Clock Division (CKD)	<b>Division by 4 *</b>
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)
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Trigger Event Selection                      Reset (UG bit from TIMx\_EGR)

**Input Capture Channel 1:**

Polarity Selection	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter (4 bits value)	0

## 5.8. TIM6

**mode: Activated**

### 5.8.1. Parameter Settings:

**Counter Settings:**

Prescaler (PSC - 16 bits value)	<b>512 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value )	0
auto-reload preload	Disable

**Trigger Output (TRGO) Parameters:**

Trigger Event Selection	Reset (UG bit from TIMx_EGR)
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## 5.9. TIM17

**mode: Activated**

**Channel1: Input Capture direct mode**

### 5.9.1. Parameter Settings:

**Counter Settings:**

Prescaler (PSC - 16 bits value)	<b>512 *</b>
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value )	0
Internal Clock Division (CKD)	<b>Division by 4 *</b>
Repetition Counter (RCR - 8 bits value)	0
auto-reload preload	Disable

**Input Capture Channel 1:**

Polarity Selection	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter (4 bits value)	0

## 5.10. USART1

Mode: Asynchronous

### 5.10.1. Parameter Settings:

#### Basic Parameters:

Baud Rate	31250 *
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

## 5.11. USB

mode: Device (FS)

### 5.11.1. Parameter Settings:

#### Basic Parameters:

Speed	Full Speed 12MBit/s
Endpoint 0 Max Packet size	64 Bytes
Physical interface	Internal Phy

#### Power Parameters:

Low Power	Disabled
Link Power Management	Disabled

## 5.12. USB\_DEVICE

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

#### 5.12.1. 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	1000
USB CDC Tx Buffer Size	1000

#### 5.12.2. 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
ADC	PA0	ADC_IN0	Analog mode	No pull-up and no pull-down	n/a	ADC_SHAPE1
	PA1	ADC_IN1	Analog mode	No pull-up and no pull-down	n/a	ADC_SHAPE2
	PA2	ADC_IN2	Analog mode	No pull-up and no pull-down	n/a	ADC_LFOSHAPE
	PA3	ADC_IN3	Analog mode	No pull-up and no pull-down	n/a	ADC_LFOFREQ
	PA6	ADC_IN6	Analog mode	No pull-up and no pull-down	n/a	ADC_GLIDE
DAC	PA4	DAC_OUT1	Analog mode	No pull-up and no pull-down	n/a	DAC_M
	PA5	DAC_OUT2	Analog mode	No pull-up and no pull-down	n/a	DAC_LFO
RCC	PF0-OSC_IN	RCC_OSC_IN	n/a	n/a	n/a	
	PF1-OSC_OUT	RCC_OSC_OUT	n/a	n/a	n/a	
SPI1	PB3	SPI1_SCK	Alternate Function Push Pull	No pull-up and no pull-down	Low	IN165_CLK
	PB4	SPI1_MISO	Alternate Function Push Pull	No pull-up and no pull-down	Low	IN165_MISO
SPI2	PB10	SPI2_SCK	Alternate Function Push Pull	No pull-up and no pull-down	Low	OUT595_CLK
	PB15	SPI2_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	Low	OUT595_MOSI
SYS	PA13	SYS_SWDIO	n/a	n/a	n/a	
	PA14	SYS_SWCLK	n/a	n/a	n/a	
TIM1	PA8	TIM1_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	OSC1TUNE_IN
TIM17	PB9	TIM17_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	OSC2TUNE_IN
USART1	PA9	USART1_TX	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA10	USART1_RX	Alternate Function Push Pull	No pull-up and no pull-down	Low	
USB	PA11	USB_DM	n/a	n/a	n/a	
	PA12	USB_DP	n/a	n/a	n/a	
GPIO	PC13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	GATE_OUT
	PC14-OSC32_IN	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DACM_EN
	PC15-OSC32_OUT	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	OSC2_MODEN
	PA7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	OSC1_MODEN
	PB0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	OUTPUT_EN
	PB1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	OSCSUNC_DIS
	PB2	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	LFOTRIG_IN
	PB11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DACM_SEL2
	PB12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	OUT595_LATCH
	PB13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DACM_SEL0
	PB14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DACM_SEL1
	PA15	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	IN165_LATCH

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PB5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	OSC1WFSEL0
	PB6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	OSC1WFSEL1
	PB7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	OSC2WFSEL0
	PB8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	OSC2WFSEL1

## 6.2. DMA configuration

DMA request	Stream	Direction	Priority
SPI1_RX	DMA1_Channel2	Peripheral To Memory	Low
ADC	DMA1_Channel1	Peripheral To Memory	<b>Very High *</b>
SPI2_TX	DMA1_Channel5	Memory To Peripheral	Low
TIM1_CH1/CH2/CH3	DMA1_Channel6	Memory To Peripheral	<b>High *</b>
TIM17_CH1/UP	DMA1_Channel7	Memory To Peripheral	<b>High *</b>

### SPI1\_RX: DMA1\_Channel2 DMA request Settings:

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

### ADC: DMA1\_Channel1 DMA request Settings:

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

### SPI2\_TX: DMA1\_Channel5 DMA request Settings:

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

### TIM1\_CH1/CH2/CH3: DMA1\_Channel6 DMA request Settings:

Mode: **Circular \***  
Peripheral Increment: Disable  
Memory Increment: Disable

Peripheral Data Width: Half Word  
Memory Data Width: Half Word

*TIM17\_CH1/UP: DMA1\_Channel7 DMA request Settings:*

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

### 6.3. 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
DMA1 channel 1 global interrupt	true	0	0
DMA1 channel 2 and 3 interrupts	true	0	0
DMA1 channel 4, 5, 6 and 7 interrupts	true	0	0
TIM6 global and DAC channel underrun error interrupts	true	0	0
USART1 global interrupt / USART1 wake-up interrupt through EXTI line 25	true	0	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		
Flash global interrupt	unused		
RCC and CRS global interrupts	unused		
ADC and COMP interrupts (COMP interrupts through EXTI lines 21 and 22)	unused		
TIM1 break, update, trigger and commutation interrupts	unused		
TIM1 capture compare interrupt	unused		
TIM17 global interrupt	unused		
SPI1 global interrupt	unused		
SPI2 global interrupt	unused		

\* User modified value



## 7. Power Consumption Calculator report

### 7.1. Microcontroller Selection

Series	STM32F0
Line	STM32F0x2
MCU	STM32F072CBTx
Datasheet	025004_Rev5

### 7.2. Parameter Selection

Temperature	25
Vdd	3.6

## 8. Software Project

### 8.1. Project Settings

Name	Value
Project Name	neutr_cube
Project Folder	C:\v\neutron_proj_ac6\neutr_cube
Toolchain / IDE	SW4STM32
Firmware Package Name and Version	STM32Cube FW_F0 V1.9.0

### 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

## ***9. Software Pack Report***