1. Description

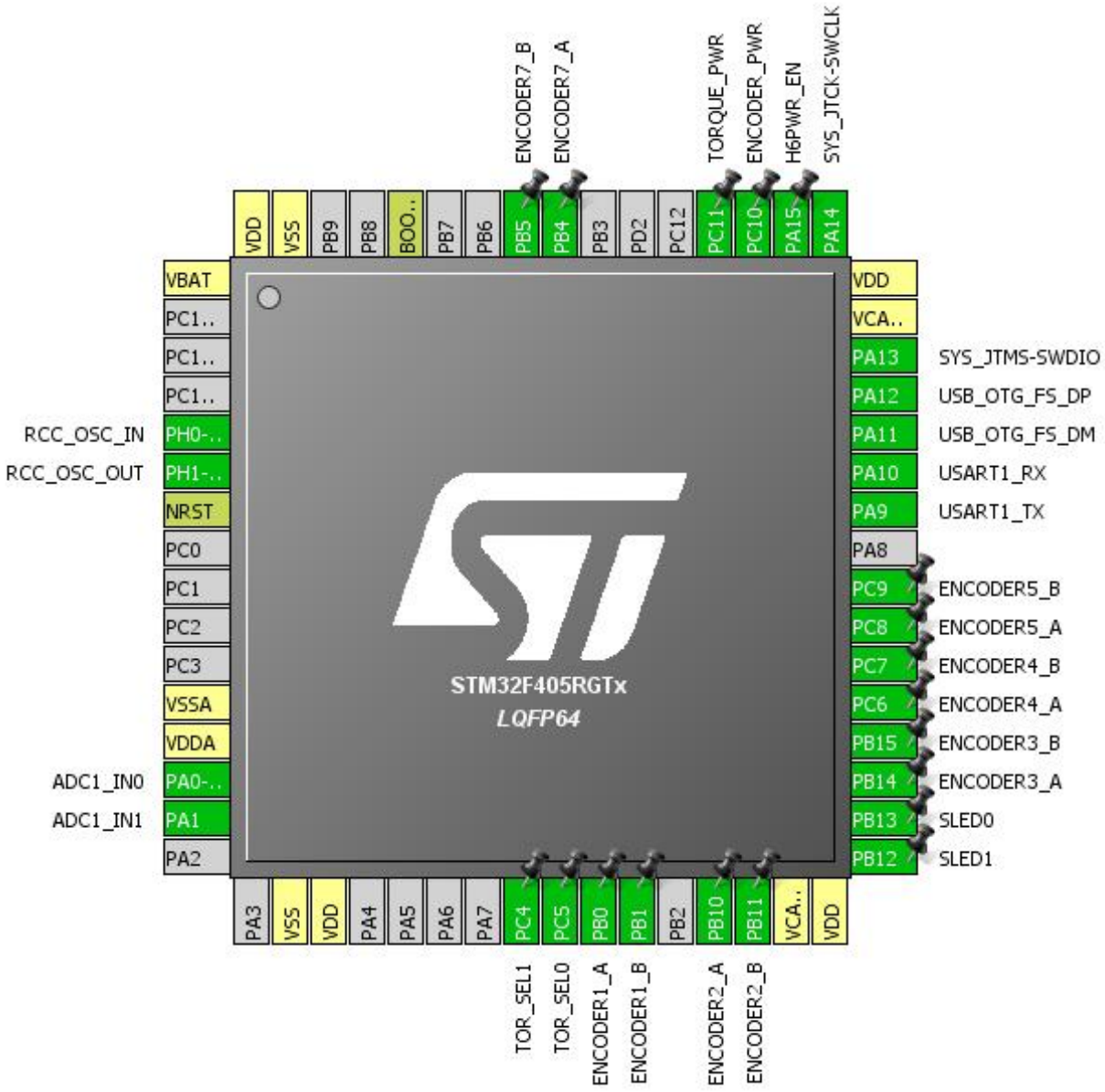
1.1. Project

Project Name	torque
Board Name	torque
Generated with:	STM32CubeMX 4.23.0
Date	11/09/2019

1.2. MCU

MCU Series	STM32F4
MCU Line	STM32F405/415
MCU name	STM32F405RGTx
MCU Package	LQFP64
MCU Pin number	64

2. Pinout Configuration



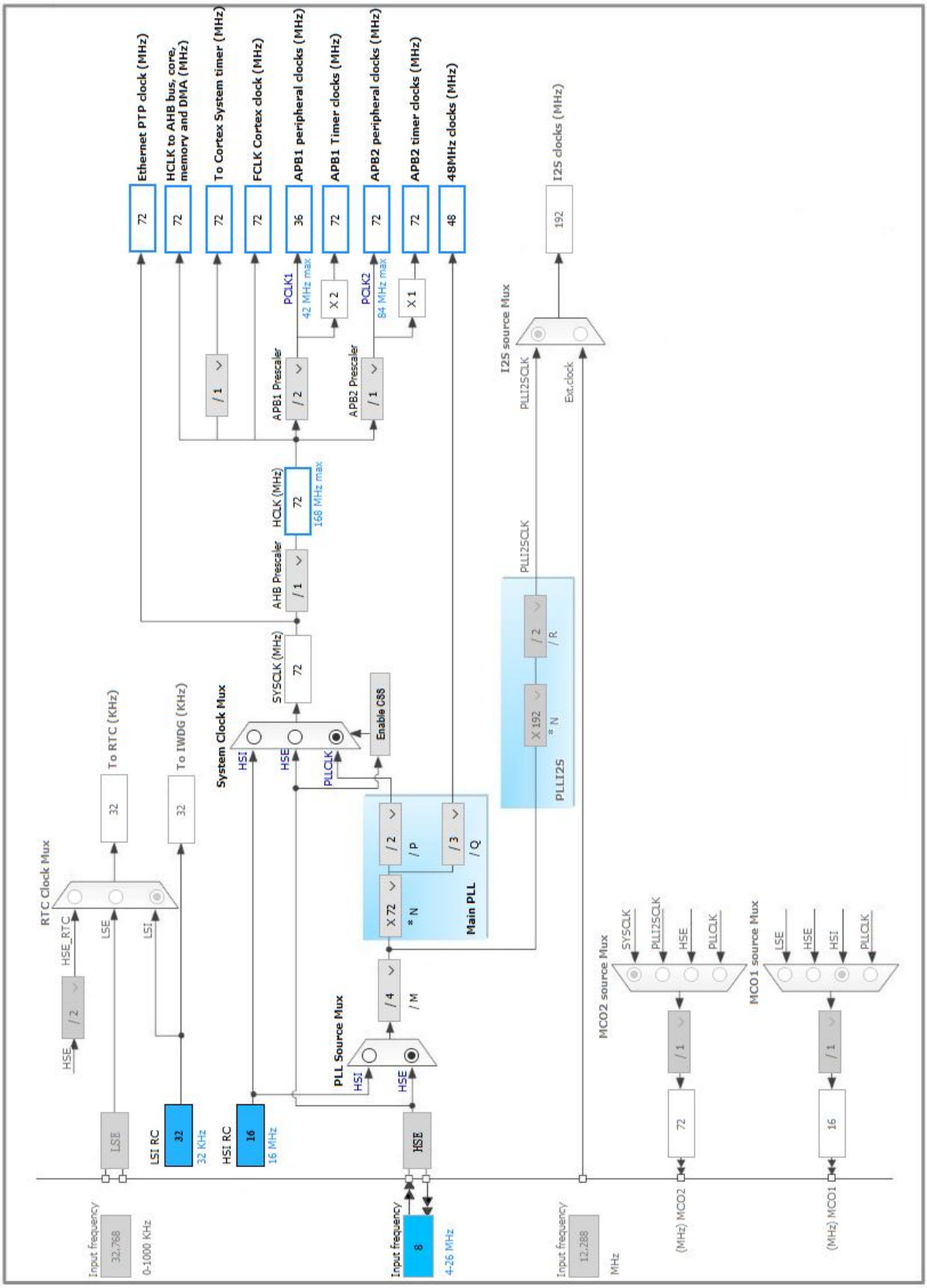
3. Pins Configuration

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
5	PH0-OSC_IN	I/O	RCC_OSC_IN	
6	PH1-OSC_OUT	I/O	RCC_OSC_OUT	
7	NRST	Reset		
12	VSSA	Power		
13	VDDA	Power		
14	PA0-WKUP	I/O	ADC1_IN0	
15	PA1	I/O	ADC1_IN1	
18	VSS	Power		
19	VDD	Power		
24	PC4 *	I/O	GPIO_Output	TOR_SEL1
25	PC5 *	I/O	GPIO_Output	TOR_SEL0
26	PB0	I/O	GPIO_EXTI0	ENCODER1_A
27	PB1 *	I/O	GPIO_Input	ENCODER1_B
29	PB10	I/O	GPIO_EXTI10	ENCODER2_A
30	PB11 *	I/O	GPIO_Input	ENCODER2_B
31	VCAP_1	Power		
32	VDD	Power		
33	PB12 *	I/O	GPIO_Output	SLED1
34	PB13 *	I/O	GPIO_Output	SLED0
35	PB14	I/O	GPIO_EXTI14	ENCODER3_A
36	PB15 *	I/O	GPIO_Input	ENCODER3_B
37	PC6	I/O	GPIO_EXTI6	ENCODER4_A
38	PC7 *	I/O	GPIO_Input	ENCODER4_B
39	PC8	I/O	GPIO_EXTI8	ENCODER5_A
40	PC9 *	I/O	GPIO_Input	ENCODER5_B
42	PA9	I/O	USART1_TX	
43	PA10	I/O	USART1_RX	
44	PA11	I/O	USB_OTG_FS_DM	
45	PA12	I/O	USB_OTG_FS_DP	
46	PA13	I/O	SYS_JTMS-SWDIO	
47	VCAP_2	Power		
48	VDD	Power		
49	PA14	I/O	SYS_JTCK-SWCLK	
50	PA15 *	I/O	GPIO_Output	H6PWR_EN
51	PC10 *	I/O	GPIO_Output	ENCODER_PWR

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
52	PC11 *	I/O	GPIO_Output	TORQUE_PWR
56	PB4	I/O	GPIO_EXTI4	ENCODER7_A
57	PB5 *	I/O	GPIO_Input	ENCODER7_B
60	BOOT0	Boot		
63	VSS	Power		
64	VDD	Power		

* The pin is affected with an I/O function

4. Clock Tree Configuration



5. IPs and Middleware Configuration

5.1. ADC1

mode: IN0

mode: IN1

5.1.1. Parameter Settings:

ADCs_Common_Settings:

Mode	Independent mode

ADC_Settings:

Clock Prescaler	PCLK2 divided by 2
Resolution	12 bits (15 ADC Clock cycles)
Data Alignment	Right alignment
Scan Conversion Mode	Disabled
Continuous Conversion Mode	Disabled
Discontinuous Conversion Mode	Disabled
DMA Continuous Requests	Disabled
End Of Conversion Selection	EOC flag at the end of single channel conversion

ADC_Regular_ConversionMode:

Number Of Conversion	1
External Trigger Conversion Source	Regular Conversion launched by software
External Trigger Conversion Edge	None
Rank	1
Channel	Channel 0
Sampling Time	3 Cycles

ADC_Injected_ConversionMode:

Number Of Conversions	0

WatchDog:

Enable Analog WatchDog Mode	false

5.2. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

5.2.1. 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
HSE Startup Timout Value (ms)	100
LSE Startup Timout Value (ms)	5000

Power Parameters:

Power Regulatror Voltage Scale	Power Regulator Voltage Scale 1

5.3. SYS

Debug: Serial Wire

Timebase Source: SysTick

5.4. USART1

Mode: Asynchronous

5.4.1. 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

5.5. USB_OTG_FS

Mode: Device_Only

5.5.1. 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	Disabled
Signal start of frame	Disabled

*** 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	PA0-WKUP	ADC1_IN0	Analog mode	No pull-up and no pull-down	n/a	
	PA1	ADC1_IN1	Analog mode	No pull-up and no pull-down	n/a	
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	
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
USART1	PA9	USART1_TX	Alternate Function Push Pull	Pull-up	**Very High ***	
	PA10	USART1_RX	Alternate Function Push Pull	Pull-up	**Very High ***	
USB_OTG_FS	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	PC4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	TOR_SEL1
	PC5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	TOR_SEL0
	PB0	GPIO_EXTI0	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	ENCODER1_A
	PB1	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	ENCODER1_B
	PB10	GPIO_EXTI10	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	ENCODER2_A
	PB11	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	ENCODER2_B
	PB12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	SLED1
	PB13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	SLED0
	PB14	GPIO_EXTI14	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	ENCODER3_A
	PB15	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	ENCODER3_B
	PC6	GPIO_EXTI6	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	ENCODER4_A
	PC7	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	ENCODER4_B
	PC8	GPIO_EXTI8	External Interrupt Mode with	No pull-up and no pull-down	n/a	ENCODER5_A

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
			Rising edge trigger detection			
	PC9	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	ENCODER5_B
	PA15	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	H6PWR_EN
	PC10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ENCODER_PWR
	PC11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	TORQUE_PWR
	PB4	GPIO_EXTI4	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	ENCODER7_A
	PB5	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	ENCODER7_B

6.2. DMA configuration

nothing configured in DMA service

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
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
EXTI line0 interrupt	unused		
EXTI line4 interrupt	unused		
ADC1, ADC2 and ADC3 global interrupts	unused		
EXTI line[9:5] interrupts	unused		
USART1 global interrupt	unused		
EXTI line[15:10] interrupts	unused		
USB On The Go FS global interrupt	unused		
FPU global interrupt	unused		

*** User modified value**

7. Power Consumption Calculator report

7.1. Microcontroller Selection

Series	STM32F4
Line	STM32F405/415
MCU	STM32F405RGTx
Datasheet	022152_Rev8

7.2. Parameter Selection

Temperature	25
Vdd	3.3

8. Software Project

8.1. Project Settings

Name	Value
Project Name	torque
Project Folder	D:\\\\\torque
Toolchain / IDE	MDK-ARM V5
Firmware Package Name and Version	STM32Cube FW_F4 V1.18.0

8.2. Code Generation Settings

Name	Value
STM32Cube Firmware Library Package	Copy all used libraries into the project folder
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