1. Description

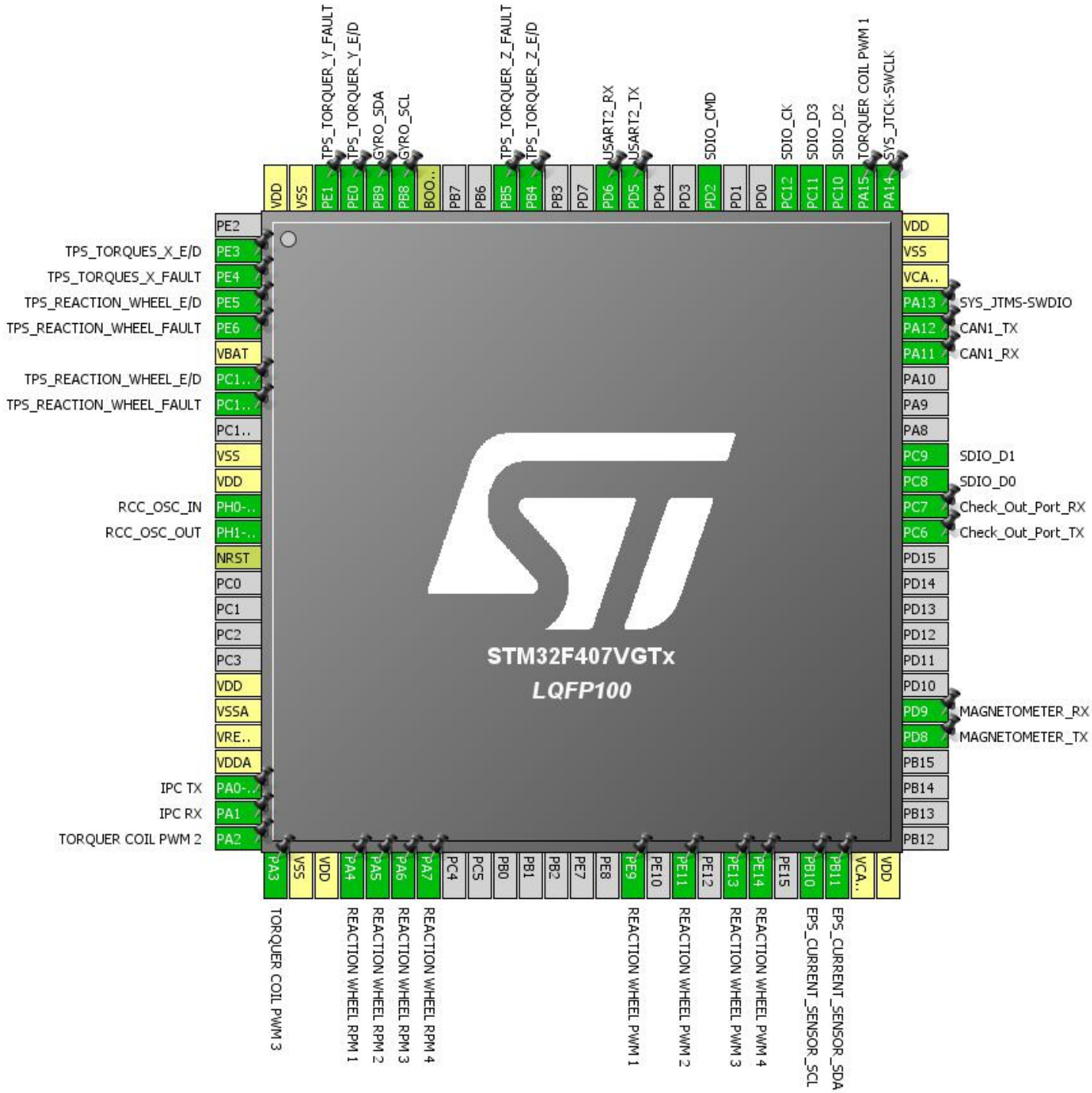
1.1. Project

Project Name	adcs407
Board Name	adcs407
Generated with:	STM32CubeMX 4.19.0
Date	02/08/2017

1.2. MCU

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

2. Pinout Configuration



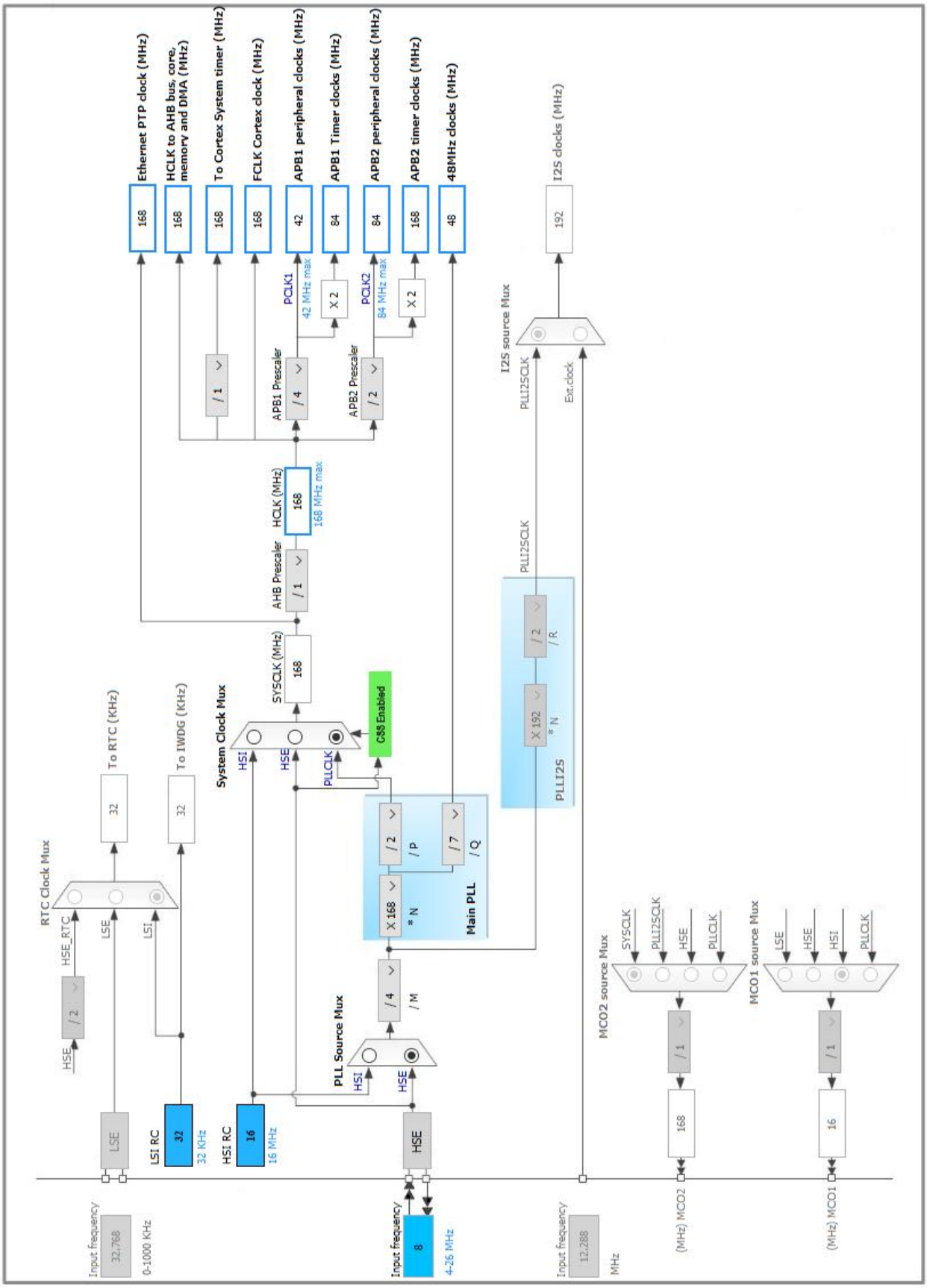
3. Pins Configuration

Pin Number LQFP100	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
2	PE3 *	I/O	GPIO_Output	TPS_TORQUES_X_E/D
3	PE4 *	I/O	GPIO_Input	TPS_TORQUES_X_FAULT
4	PE5 *	I/O	GPIO_Output	TPS_REACTION_WHEEL_E/D
5	PE6 *	I/O	GPIO_Input	TPS_REACTION_WHEEL_FAULT
6	VBAT	Power		
7	PC13-ANTI_TAMP *	I/O	GPIO_Output	TPS_REACTION_WHEEL_E/D
8	PC14-OSC32_IN *	I/O	GPIO_Input	TPS_REACTION_WHEEL_FAULT
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	UART4_TX	IPC TX
24	PA1	I/O	UART4_RX	IPC RX
25	PA2	I/O	TIM2_CH3	TORQUER COIL PWM 2
26	PA3	I/O	TIM2_CH4	TORQUER COIL PWM 3
27	VSS	Power		
28	VDD	Power		
29	PA4	I/O	ADC1_IN4	REACTION WHEEL RPM 1
30	PA5	I/O	ADC1_IN5	REACTION WHEEL RPM 2
31	PA6	I/O	ADC1_IN6	REACTION WHEEL RPM 3
32	PA7	I/O	ADC1_IN7	REACTION WHEEL RPM 4
40	PE9	I/O	TIM1_CH1	REACTION WHEEL PWM 1
42	PE11	I/O	TIM1_CH2	REACTION WHEEL PWM 2
44	PE13	I/O	TIM1_CH3	REACTION WHEEL PWM 3
45	PE14	I/O	TIM1_CH4	REACTION WHEEL PWM 4
47	PB10	I/O	I2C2_SCL	EPS_CURRENT_SENSOR_SCL

Pin Number LQFP100	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
48	PB11	I/O	I2C2_SDA	EPS_CURRENT_SENSOR_SDA
49	VCAP_1	Power		
50	VDD	Power		
55	PD8	I/O	USART3_TX	MAGNETOMETER_TX
56	PD9	I/O	USART3_RX	MAGNETOMETER_RX
63	PC6	I/O	USART6_TX	Check_Out_Port_TX
64	PC7	I/O	USART6_RX	Check_Out_Port_RX
65	PC8	I/O	SDIO_D0	
66	PC9	I/O	SDIO_D1	
70	PA11	I/O	CAN1_RX	
71	PA12	I/O	CAN1_TX	
72	PA13	I/O	SYS_JTMS-SWDIO	
73	VCAP_2	Power		
74	VSS	Power		
75	VDD	Power		
76	PA14	I/O	SYS_JTCK-SWCLK	
77	PA15	I/O	TIM2_CH1	TORQUER COIL PWM 1
78	PC10	I/O	SDIO_D2	
79	PC11	I/O	SDIO_D3	
80	PC12	I/O	SDIO_CK	
83	PD2	I/O	SDIO_CMD	
86	PD5	I/O	USART2_TX	
87	PD6	I/O	USART2_RX	
90	PB4 *	I/O	GPIO_Output	TPS_TORQUER_Z_E/D
91	PB5 *	I/O	GPIO_Input	TPS_TORQUER_Z_FAULT
94	BOOT0	Boot		
95	PB8	I/O	I2C1_SCL	GYRO_SCL
96	PB9	I/O	I2C1_SDA	GYRO_SDA
97	PE0 *	I/O	GPIO_Output	TPS_TORQUER_Y_E/D
98	PE1 *	I/O	GPIO_Input	TPS_TORQUER_Y_FAULT
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: IN4

mode: IN5

mode: IN6

mode: IN7

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	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	**4 ***
External Trigger Conversion Source	**Timer 1 Capture Compare 1 event ***
External Trigger Conversion Edge	Trigger detection on the rising edge
Rank	1
Channel	Channel 4
Sampling Time	**15 Cycles ***
Rank	**2 ***
Channel	**Channel 5 ***
Sampling Time	**15 Cycles ***
Rank	**3 ***
Channel	**Channel 6 ***
Sampling Time	**15 Cycles ***
Rank	**4 ***
Channel	**Channel 7 ***
Sampling Time	

	15 Cycles *

ADC_Injected_ConversionMode:

Number Of Conversions	0

WatchDog:

Enable Analog WatchDog Mode	false

5.2. CAN1

mode: Mode

5.2.1. Parameter Settings:

Bit Timings Parameters:

Prescaler (for Time Quantum)	16
Time Quantum	**380.95238095238096 ***
Time Quanta in Bit Segment 1	1 Time
Time Quanta in Bit Segment 2	1 Time
Time for one Bit	**1142 ***
ReSynchronization Jump Width	1 Time

Basic Parameters:

Time Triggered Communication Mode	Disable
Automatic Bus-Off Management	Disable
Automatic Wake-Up Mode	Disable
No-Automatic Retransmission	Disable
Receive Fifo Locked Mode	Disable
Transmit Fifo Priority	Disable

Advanced Parameters:

Operating Mode	Normal

5.3. I2C1

I2C: I2C

5.3.1. 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

5.4. I2C2

I2C: I2C

5.4.1. 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

5.5. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

5.5.1. 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)

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

5.6. SDIO

Mode: SD 4 bits Wide bus

5.6.1. Parameter Settings:

SDIO parameters:

SDIOCLK clock divide factor	0

5.7. SYS

Debug: Serial Wire

Timebase Source: TIM3

5.8. TIM1

Clock Source : Internal Clock

Channel1: PWM Generation CH1

Channel2: PWM Generation CH2

Channel3: PWM Generation CH3

Channel4: PWM Generation CH4

5.8.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	0
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	Reset (UG bit from TIMx_EGR)

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

PWM Generation Channel 2:

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

PWM Generation Channel 3:

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

PWM Generation Channel 4:

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

5.9. TIM2

Clock Source : Internal Clock

Channel1: PWM Generation CH1

Channel3: PWM Generation CH3

Channel4: PWM Generation CH4

5.9.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 32 bits value)	0
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 1:

Mode	PWM mode 1
Pulse (32 bits value)	0
Fast Mode	Disable
CH Polarity	High

PWM Generation Channel 3:

Mode	PWM mode 1
Pulse (32 bits value)	0
Fast Mode	Disable
CH Polarity	High

PWM Generation Channel 4:

Mode	PWM mode 1
Pulse (32 bits value)	0
Fast Mode	Disable
CH Polarity	High

5.10. UART4

Mode: Asynchronous

5.10.1. 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

5.11. USART2

Mode: Asynchronous

5.11.1. Parameter Settings:

Basic Parameters:

Baud Rate	**9600 ***
Word Length	8 Bits (including Parity)
Parity	None
Stop Bits	1

Advanced Parameters:

Data Direction	Receive and Transmit
Over Sampling	16 Samples

5.12. USART3

Mode: Asynchronous

5.12.1. Parameter Settings:

Basic Parameters:

Baud Rate	**9600 ***
Word Length	8 Bits (including Parity)
Parity	None
Stop Bits	1

Advanced Parameters:

Data Direction	Receive and Transmit
Over Sampling	16 Samples

5.13. USART6

Mode: Asynchronous

5.13.1. 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

5.14. FREERTOS

mode: Enabled

5.14.1. Config parameters:

Versions:

FreeRTOS version	8.2.3
CMSIS-RTOS version	1.02

Kernel settings:

USE_PREEMPTION	Enabled
CPU_CLOCK_HZ	SystemCoreClock
TICK_RATE_HZ	1000
MAX_PRIORITIES	7
MINIMAL_STACK_SIZE	128
MAX_TASK_NAME_LEN	16
USE_16_BIT_TICKS	Disabled
IDLE_SHOULD_YIELD	Enabled
USE_MUTEXES	Enabled
USE_RECURSIVE_MUTEXES	Disabled
USE_COUNTING_SEMAPHORES	Disabled
QUEUE_REGISTRY_SIZE	8
USE_APPLICATION_TASK_TAG	Disabled
USE_ALTERNATIVE_API	Disabled
ENABLE_BACKWARD_COMPATIBILITY	Enabled
USE_PORT_OPTIMISED_TASK_SELECTION	Disabled
USE_TICKLESS_IDLE	Disabled
USE_TASK_NOTIFICATIONS	Enabled

Memory management settings:

TOTAL_HEAP_SIZE	15360

Memory Management scheme	heap_4

Hook function related definitions:

USE_IDLE_HOOK	Disabled
USE_TICK_HOOK	Disabled
USE_MALLOC_FAILED_HOOK	Disabled
CHECK_FOR_STACK_OVERFLOW	Disabled

Run time and task stats gathering related definitions:

USE_TRACE_FACILITY	Enabled
GENERATE_RUN_TIME_STATS	Disabled

Co-routine related definitions:

USE_CO_ROUTINES	Disabled
MAX_CO_ROUTINE_PRIORITIES	2

Software timer definitions:

USE_TIMERS	Disabled

Interrupt nesting behaviour configuration:

LIBRARY_LOWEST_INTERRUPT_PRIORITY	15
LIBRARY_MAX_SYSCALL_INTERRUPT_PRIORITY	5

5.14.2. Include parameters:

Include definitions:

vTaskPrioritySet	Enabled
uxTaskPriorityGet	Enabled
vTaskDelete	Enabled
vTaskCleanUpResources	Disabled
vTaskSuspend	Enabled
vTaskDelayUntil	Disabled
vTaskDelay	Enabled
xTaskGetSchedulerState	Enabled
xTaskResumeFromISR	Enabled
xQueueGetMutexHolder	Disabled
xSemaphoreGetMutexHolder	Disabled
pcTaskGetTaskName	Disabled
uxTaskGetStackHighWaterMark	Disabled
xTaskGetCurrentTaskHandle	Disabled
eTaskGetState	Disabled
xEventGroupSetBitFromISR	Disabled
xTimerPendFunctionCall	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	PA4	ADC1_IN4	Analog mode	No pull-up and no pull-down	n/a	REACTION WHEEL RPM 1
	PA5	ADC1_IN5	Analog mode	No pull-up and no pull-down	n/a	REACTION WHEEL RPM 2
	PA6	ADC1_IN6	Analog mode	No pull-up and no pull-down	n/a	REACTION WHEEL RPM 3
	PA7	ADC1_IN7	Analog mode	No pull-up and no pull-down	n/a	REACTION WHEEL RPM 4
CAN1	PA11	CAN1_RX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	
	PA12	CAN1_TX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	
I2C1	PB8	I2C1_SCL	Alternate Function Open Drain	Pull-up	**Very High ***	GYRO_SCL
	PB9	I2C1_SDA	Alternate Function Open Drain	Pull-up	**Very High ***	GYRO_SDA
I2C2	PB10	I2C2_SCL	Alternate Function Open Drain	Pull-up	**Very High ***	EPS_CURRENT_SENSOR_SCL
	PB11	I2C2_SDA	Alternate Function Open Drain	Pull-up	**Very High ***	EPS_CURRENT_SENSOR_SDA
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	
SDIO	PC8	SDIO_D0	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PC9	SDIO_D1	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PC10	SDIO_D2	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PC11	SDIO_D3	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PC12	SDIO_CK	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PD2	SDIO_CMD	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
TIM1	PE9	TIM1_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	REACTION WHEEL PWM 1
	PE11	TIM1_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	REACTION WHEEL PWM 2
	PE13	TIM1_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	REACTION WHEEL PWM 3
	PE14	TIM1_CH4	Alternate Function Push Pull	No pull-up and no pull-down	Low	REACTION WHEEL PWM 4
TIM2	PA2	TIM2_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	TORQUER COIL PWM 2
	PA3	TIM2_CH4	Alternate Function Push Pull	No pull-up and no pull-down	Low	TORQUER COIL PWM 3
	PA15	TIM2_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	TORQUER COIL PWM 1
UART4	PA0-WKUP	UART4_TX	Alternate Function Push Pull	Pull-up	**Very High ***	IPC TX
	PA1	UART4_RX	Alternate Function Push Pull	Pull-up	**Very High ***	IPC RX
USART2	PD5	USART2_TX	Alternate Function Push Pull	Pull-up	**Very High ***	
	PD6	USART2_RX	Alternate Function Push Pull	Pull-up	**Very High ***	
USART3	PD8	USART3_TX	Alternate Function Push Pull	Pull-up	**Very High ***	MAGNETOMETER_TX
	PD9	USART3_RX	Alternate Function Push Pull	Pull-up	**Very High ***	MAGNETOMETER_RX
USART6	PC6	USART6_TX	Alternate Function Push Pull	Pull-up	**Very High ***	Check_Out_Port_TX
	PC7	USART6_RX	Alternate Function Push Pull	Pull-up	**Very High ***	Check_Out_Port_RX
GPIO	PE3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	TPS_TORQUES_X_E/D
	PE4	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	TPS_TORQUES_X_FAULT
	PE5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	TPS_REACTION_WHEEL_E/D
	PE6	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	TPS_REACTION_WHEEL_FAULT
	PC13-ANTI_TAMP	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	TPS_REACTION_WHEEL_E/D
	PC14-OSC32_IN	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	TPS_REACTION_WHEEL_FAULT
	PB4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	TPS_TORQUER_Z_E/D
	PB5	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	TPS_TORQUER_Z_FAULT

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PE0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	TPS_TORQUER_Y_E/D
	PE1	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	TPS_TORQUER_Y_FAULT

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	15	0
System tick timer	true	15	0
TIM3 global interrupt	true	5	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
ADC1, ADC2 and ADC3 global interrupts	unused		
CAN1 TX interrupts	unused		
CAN1 RX0 interrupts	unused		
CAN1 RX1 interrupt	unused		
CAN1 SCE interrupt	unused		
TIM1 break interrupt and TIM9 global interrupt	unused		
TIM1 update interrupt and TIM10 global interrupt	unused		
TIM1 trigger and commutation interrupts and TIM11 global interrupt	unused		
TIM1 capture compare interrupt	unused		
TIM2 global interrupt	unused		
I2C1 event interrupt	unused		
I2C1 error interrupt	unused		
I2C2 event interrupt	unused		
I2C2 error interrupt	unused		
USART2 global interrupt	unused		
USART3 global interrupt	unused		
SDIO global interrupt	unused		
UART4 global interrupt	unused		
USART6 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_Rev7

7.2. Parameter Selection

Temperature	25
Vdd	3.3

8. Software Project

8.1. Project Settings

Name	Value
Project Name	adcs407
Project Folder	D:\#rtos_STUDSAT\rtos_keil\adcs407
Toolchain / IDE	MDK-ARM V5
Firmware Package Name and Version	STM32Cube FW_F4 V1.14.0

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	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