

1. Description

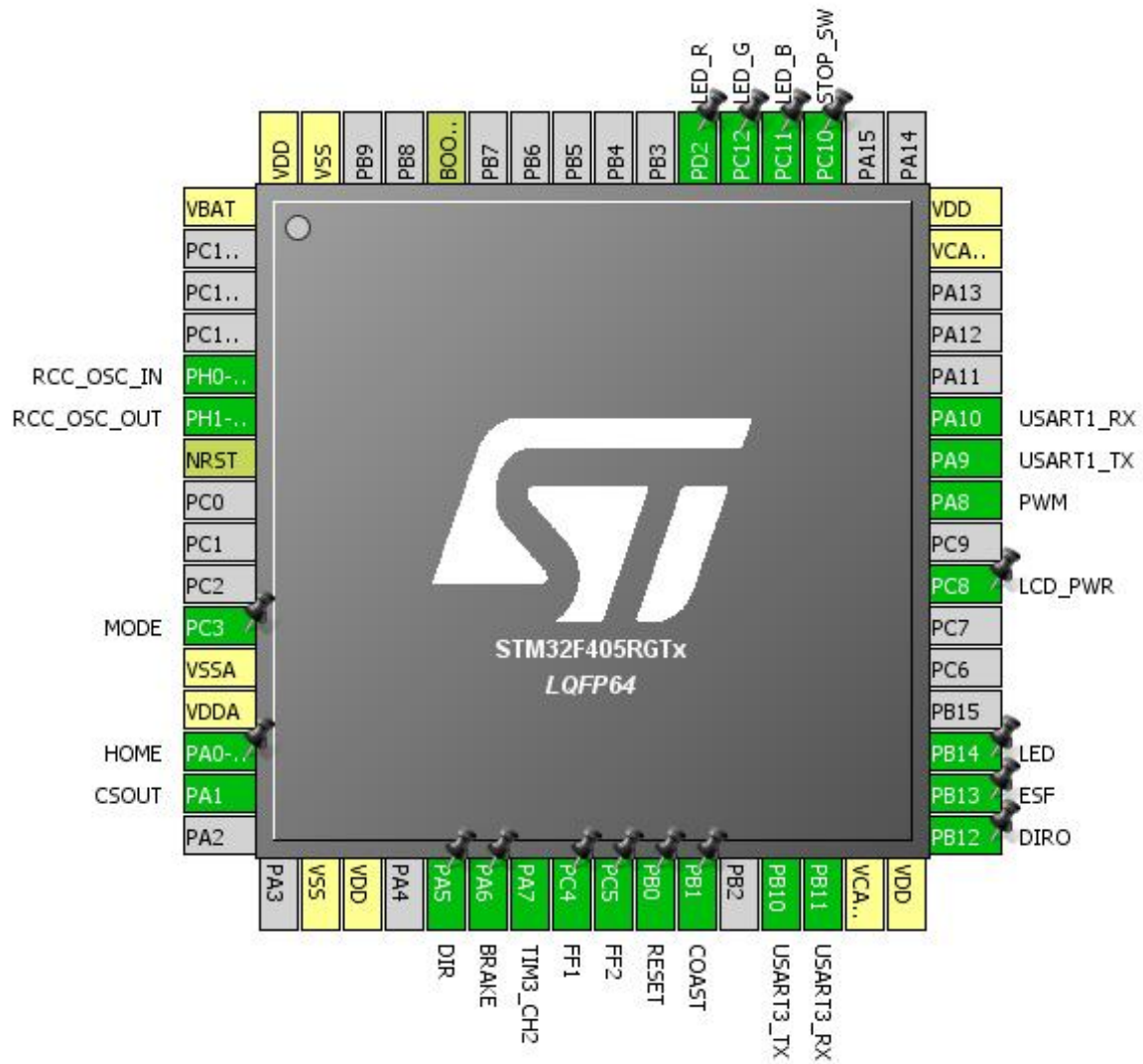
1.1. Project

Project Name	SMART_CPM_V1_3
Board Name	SMART_CPM_V1_3
Generated with:	STM32CubeMX 4.20.0
Date	05/12/2017

1.2. MCU

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

2. Pinout Configuration



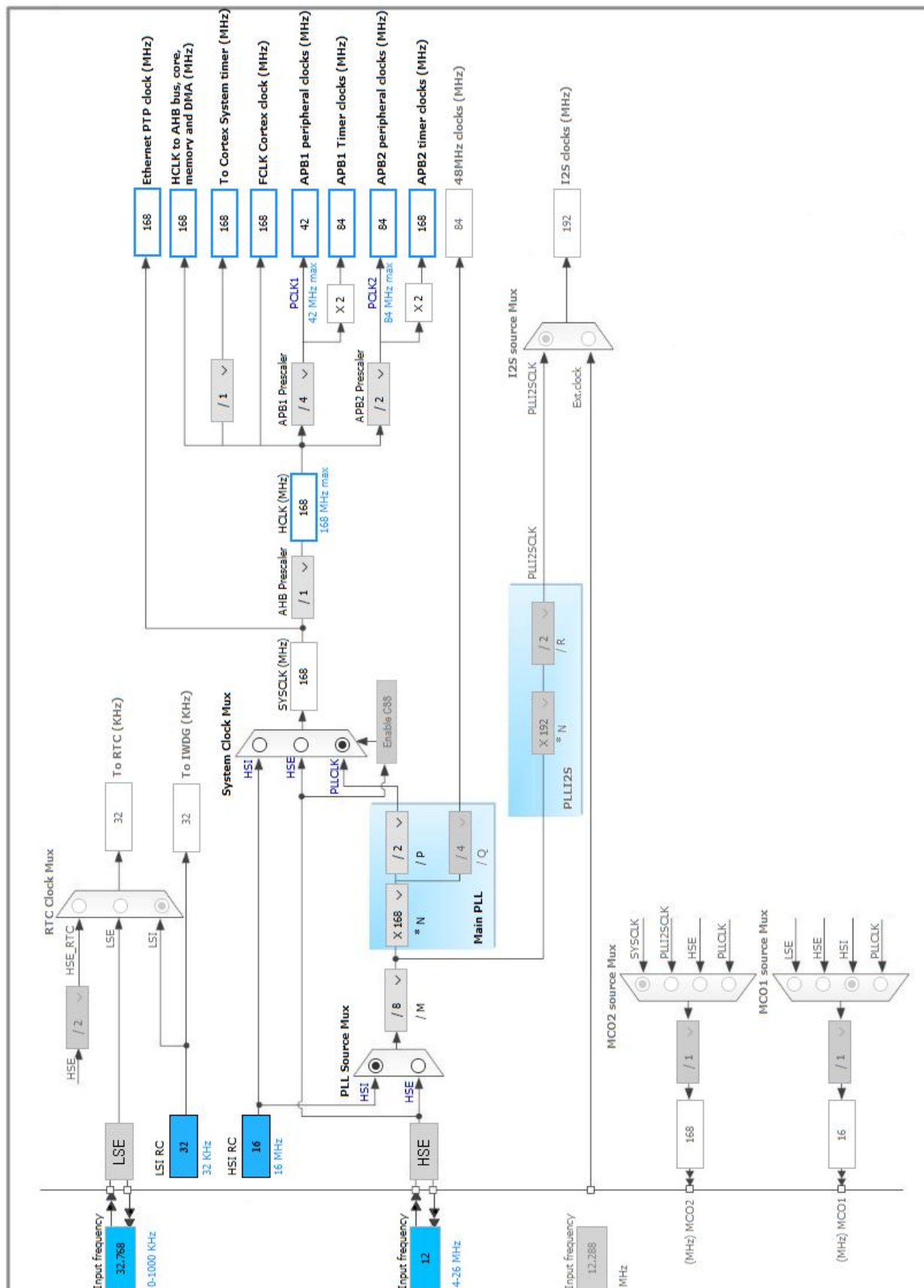
3. Pins Configuration

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		
11	PC3 *	I/O	GPIO_Output	MODE
12	VSSA	Power		
13	VDDA	Power		
14	PA0-WKUP *	I/O	GPIO_Input	HOME
15	PA1	I/O	ADC1_IN1	CSOUT
18	VSS	Power		
19	VDD	Power		
21	PA5 *	I/O	GPIO_Output	DIR
22	PA6 *	I/O	GPIO_Output	BRAKE
23	PA7	I/O	TIM3_CH2	
24	PC4 *	I/O	GPIO_Input	FF1
25	PC5 *	I/O	GPIO_Input	FF2
26	PB0 *	I/O	GPIO_Output	RESET
27	PB1 *	I/O	GPIO_Output	COAST
29	PB10	I/O	USART3_TX	
30	PB11	I/O	USART3_RX	
31	VCAP_1	Power		
32	VDD	Power		
33	PB12 *	I/O	GPIO_Input	DIRO
34	PB13 *	I/O	GPIO_Output	ESF
35	PB14 *	I/O	GPIO_Output	LED
39	PC8 *	I/O	GPIO_Output	LCD_PWR
41	PA8	I/O	TIM1_CH1	PWM
42	PA9	I/O	USART1_TX	
43	PA10	I/O	USART1_RX	
47	VCAP_2	Power		
48	VDD	Power		
51	PC10 *	I/O	GPIO_Input	STOP_SW
52	PC11 *	I/O	GPIO_Output	LED_B
53	PC12 *	I/O	GPIO_Output	LED_G
54	PD2 *	I/O	GPIO_Output	LED_R
60	BOOT0	Boot		

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
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: IN1

5.1.1. Parameter Settings:

ADCs_Common_Settings:

Mode Independent mode

ADC_Settings:

Clock Prescaler PCLK2 divided by 4

Resolution 12 bits (15 ADC Clock cycles)

Data Alignment Right alignment

Scan Conversion Mode Disabled

Continuous Conversion Mode **Enabled ***

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 Regular Conversion launched by software

External Trigger Conversion Edge None

Rank 1

Channel Channel 1

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)	5 WS (6 CPU cycle)

RCC Parameters:

HSI Calibration Value	16
HSE Startup Timeout Value (ms)	100
LSE Startup Timeout Value (ms)	5000

Power Parameters:

Power Regulator Voltage Scale	Power Regulator Voltage Scale 1
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5.3. SYS

Timebase Source: SysTick

5.4. TIM1

Channel1: PWM Generation CH1

5.4.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	800 *
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

5.5. TIM3

Slave Mode: External Clock Mode 1

Trigger Source: TI2FP2

5.5.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	10000 *
Internal Clock Division (CKD)	No Division
Slave Mode Controller	ETR mode 1

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)

Trigger:

Trigger Polarity	Both Edges *
Trigger Filter (4 bits value)	0

5.6. TIM7

mode: Activated

5.6.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	83 *
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	99 *

Trigger Output (TRGO) Parameters:

Trigger Event Selection	Reset (UG bit from TIMx_EGR)
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5.7. USART1

Mode: Asynchronous

5.7.1. 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

5.8. USART3

Mode: Asynchronous

5.8.1. 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

* 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	PA1	ADC1_IN1	Analog mode	No pull-up and no pull-down	n/a	CSOUT
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	
TIM1	PA8	TIM1_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	PWM
TIM3	PA7	TIM3_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	
USART1	PA9	USART1_TX	Alternate Function Push Pull	Pull-up	Very High *	
	PA10	USART1_RX	Alternate Function Push Pull	Pull-up	Very High *	
USART3	PB10	USART3_TX	Alternate Function Push Pull	Pull-up	Very High *	
	PB11	USART3_RX	Alternate Function Push Pull	Pull-up	Very High *	
GPIO	PC3	GPIO_Output	Output Open Drain *	No pull-up and no pull-down	Low	MODE
	PA0-WKUP	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	HOME
	PA5	GPIO_Output	Output Open Drain *	No pull-up and no pull-down	Low	DIR
	PA6	GPIO_Output	Output Open Drain *	No pull-up and no pull-down	Low	BRAKE
	PC4	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	FF1
	PC5	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	FF2
	PB0	GPIO_Output	Output Open Drain *	No pull-up and no pull-down	Low	RESET
	PB1	GPIO_Output	Output Open Drain *	No pull-up and no pull-down	Low	COAST
	PB12	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	DIRO
	PB13	GPIO_Output	Output Open Drain *	No pull-up and no pull-down	Low	ESF
	PB14	GPIO_Output	Output Push Pull	Pull-up *	Low	LED
	PC8	GPIO_Output	Output Open Drain *	No pull-up and no pull-down	Low	LCD_PWR
	PC10	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	STOP_SW
	PC11	GPIO_Output	Output Push Pull	Pull-up *	Low	LED_B
	PC12	GPIO_Output	Output Push Pull	Pull-up *	Low	LED_G

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PD2	GPIO_Output	Output Push Pull	Pull-up *	Low	LED_R

6.2. DMA configuration

DMA request	Stream	Direction	Priority
ADC1	DMA2_Stream0	Peripheral To Memory	Low
USART1_TX	DMA2_Stream7	Memory To Peripheral	High *
USART1_RX	DMA2_Stream2	Peripheral To Memory	High *

ADC1: DMA2_Stream0 DMA request Settings:

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

USART1_TX: DMA2_Stream7 DMA request Settings:

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

USART1_RX: DMA2_Stream2 DMA request Settings:

Mode: Normal
 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
USART1 global interrupt	true	0	0
TIM7 global interrupt	true	2	0
DMA2 stream0 global interrupt	true	0	0
DMA2 stream2 global interrupt	true	0	0
DMA2 stream7 global interrupt	true	0	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
ADC1, ADC2 and ADC3 global interrupts	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		
TIM3 global interrupt	unused		
USART3 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_Rev7

7.2. Parameter Selection

Temperature	25
Vdd	3.3

8. Software Project

8.1. Project Settings

Name	Value
Project Name	SMART_CPM_V1_3
Project Folder	D:\SMART ROBOTICS\CPM\SMART_CPM_V1\SMART_CPM_V1_3
Toolchain / IDE	EWARM
Firmware Package Name and Version	STM32Cube FW_F4 V1.15.0

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