1. Description

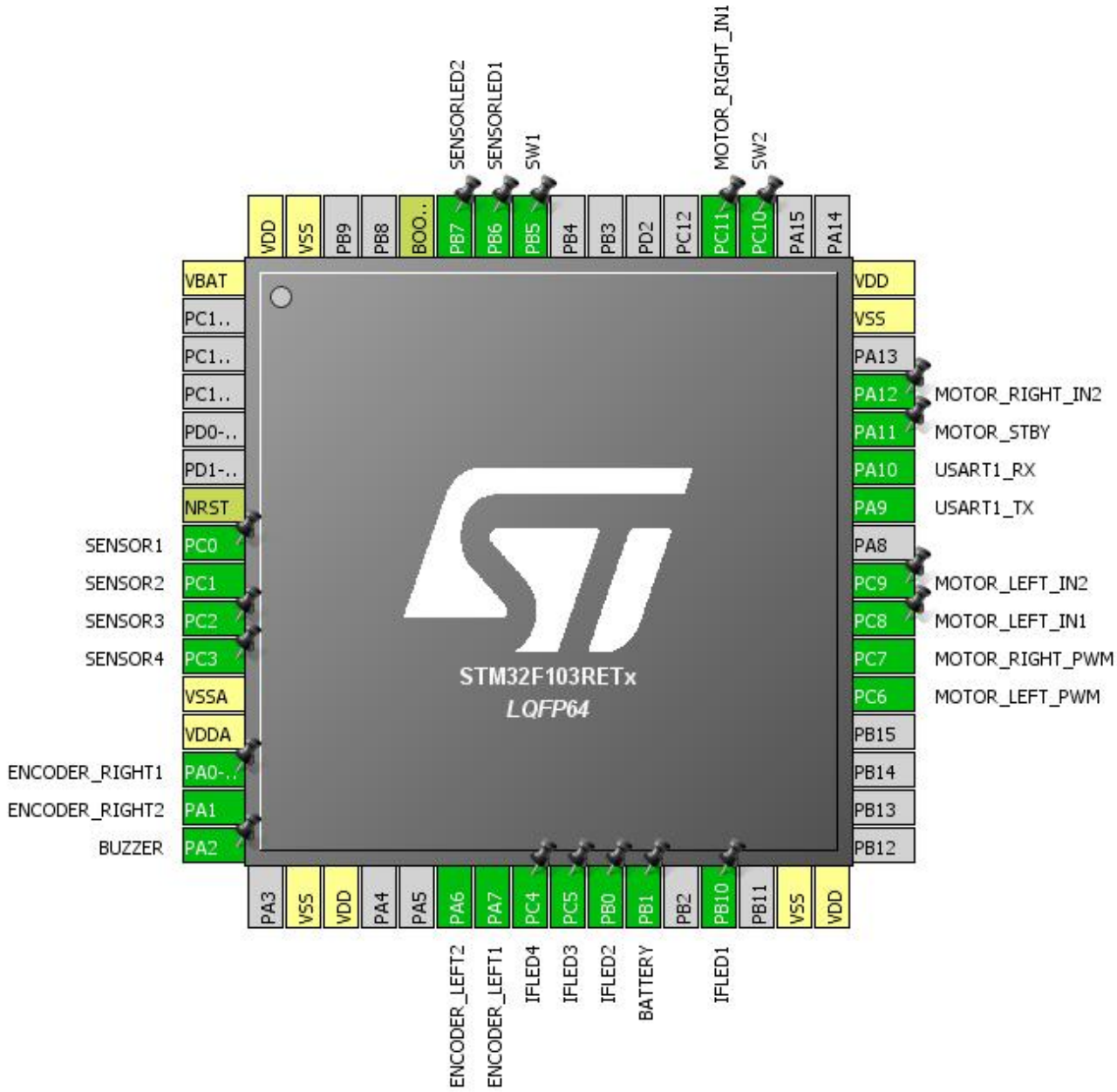
1.1. Project

Project Name	Culverton
Board Name	Culverton
Generated with:	STM32CubeMX 4.22.1
Date	10/18/2017

1.2. MCU

MCU Series	STM32F1
MCU Line	STM32F103
MCU name	STM32F103RETx
MCU Package	LQFP64
MCU Pin number	64

2. Pinout Configuration



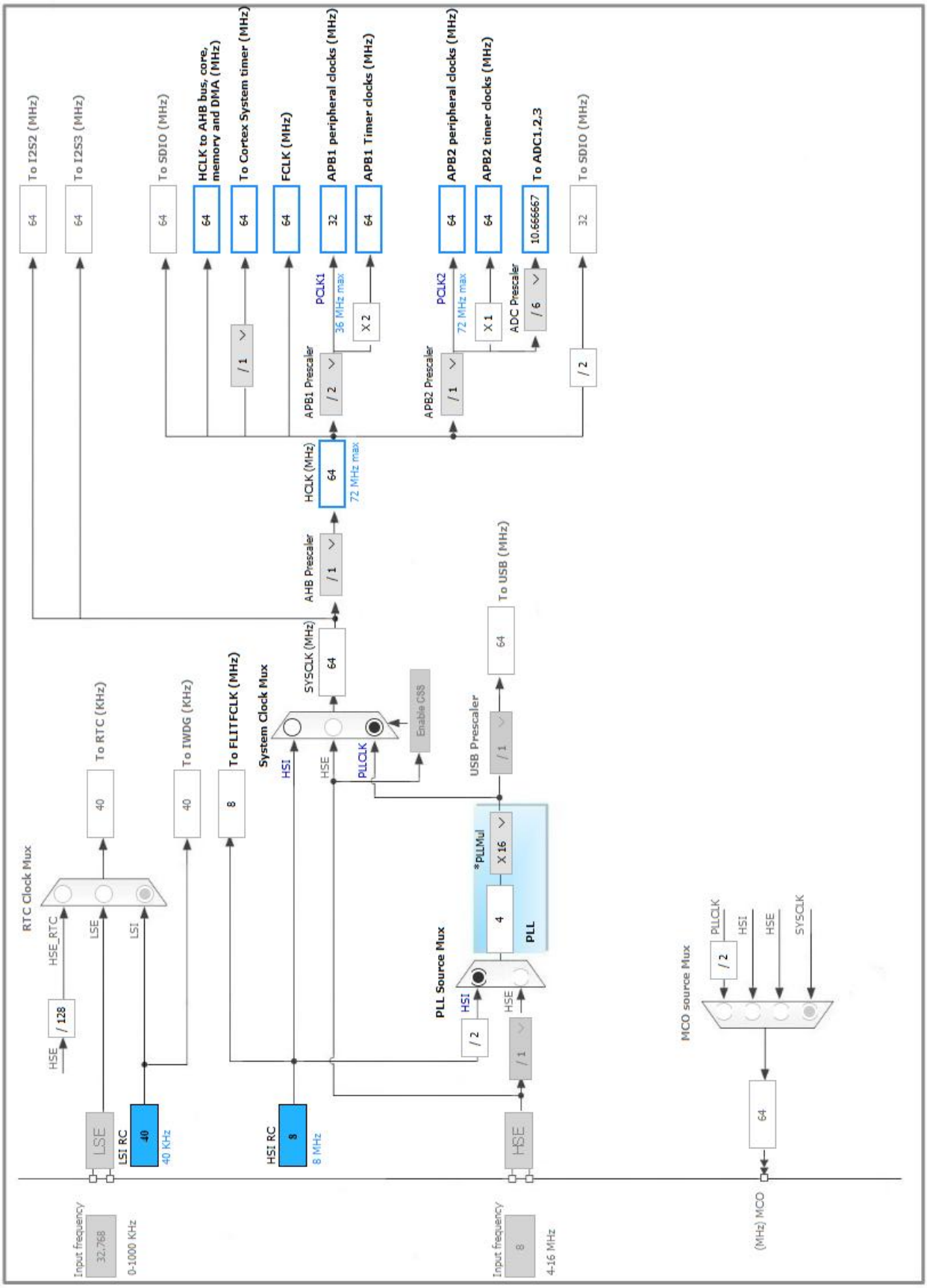
3. Pins Configuration

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
7	NRST	Reset		
8	PC0	I/O	ADC3_IN10	SENSOR1
9	PC1	I/O	ADC1_IN11	SENSOR2
10	PC2	I/O	ADC1_IN12	SENSOR3
11	PC3	I/O	ADC3_IN13	SENSOR4
12	VSSA	Power		
13	VDDA	Power		
14	PA0-WKUP	I/O	TIM2_CH1	ENCODER_RIGHT1
15	PA1	I/O	TIM2_CH2	ENCODER_RIGHT2
16	PA2	I/O	TIM5_CH3	BUZZER
18	VSS	Power		
19	VDD	Power		
22	PA6	I/O	TIM3_CH1	ENCODER_LEFT2
23	PA7	I/O	TIM3_CH2	ENCODER_LEFT1
24	PC4 *	I/O	GPIO_Output	IFLED4
25	PC5 *	I/O	GPIO_Output	IFLED3
26	PB0 *	I/O	GPIO_Output	IFLED2
27	PB1	I/O	ADC2_IN9	BATTERY
29	PB10 *	I/O	GPIO_Output	IFLED1
31	VSS	Power		
32	VDD	Power		
37	PC6	I/O	TIM8_CH1	MOTOR_LEFT_PWM
38	PC7	I/O	TIM8_CH2	MOTOR_RIGHT_PWM
39	PC8 *	I/O	GPIO_Output	MOTOR_LEFT_IN1
40	PC9 *	I/O	GPIO_Output	MOTOR_LEFT_IN2
42	PA9	I/O	USART1_TX	
43	PA10	I/O	USART1_RX	
44	PA11 *	I/O	GPIO_Output	MOTOR_STBY
45	PA12 *	I/O	GPIO_Output	MOTOR_RIGHT_IN2
47	VSS	Power		
48	VDD	Power		
51	PC10 *	I/O	GPIO_Input	SW2
52	PC11 *	I/O	GPIO_Output	MOTOR_RIGHT_IN1
57	PB5 *	I/O	GPIO_Input	SW1
58	PB6 *	I/O	GPIO_Output	SENSORLED1

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
59	PB7 *	I/O	GPIO_Output	SENSORLED2
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: IN11

mode: IN12

5.1.1. Parameter Settings:

ADCs_Common_Settings:

Mode	Independent mode

ADC_Settings:

Data Alignment	Right alignment
Scan Conversion Mode	Enabled
Continuous Conversion Mode	Disabled
Discontinuous Conversion Mode	Disabled

ADC_Regular_ConversionMode:

Enable Regular Conversions	Enable
Number Of Conversion	**2 ***
External Trigger Conversion Source	Regular Conversion launched by software
Rank	1
Channel	Channel 11
Sampling Time	1.5 Cycles
Rank	**2 ***
Channel	**Channel 12 ***
Sampling Time	1.5 Cycles

ADC_Injected_ConversionMode:

Number Of Conversions	0

WatchDog:

Enable Analog WatchDog Mode	false

5.2. ADC2

mode: IN9

5.2.1. Parameter Settings:

ADCs_Common_Settings:

Mode	Independent mode

ADC_Settings:

Data Alignment	Right alignment
Scan Conversion Mode	Disabled
Continuous Conversion Mode	Disabled
Discontinuous Conversion Mode	Disabled

ADC_Regular_ConversionMode:

Enable Regular Conversions	Enable
Number Of Conversion	1
External Trigger Conversion Source	Regular Conversion launched by software
Rank	1
Channel	Channel 9
Sampling Time	1.5 Cycles

ADC_Injected_ConversionMode:

Number Of Conversions	0

WatchDog:

Enable Analog WatchDog Mode	false

5.3. ADC3

mode: IN10

mode: IN13

5.3.1. Parameter Settings:

ADC_Settings:

Data Alignment	Right alignment
Scan Conversion Mode	Disabled
Continuous Conversion Mode	Disabled
Discontinuous Conversion Mode	Disabled

ADC_Regular_ConversionMode:

Enable Regular Conversions	Enable
Number Of Conversion	1
External Trigger Conversion Source	Regular Conversion launched by software
Rank	1
Channel	**Channel 13 ***
Sampling Time	**28.5 Cycles ***

ADC_Injected_ConversionMode:

Number Of Conversions	0

WatchDog:

Enable Analog WatchDog Mode	false

5.4. SYS

Debug: No Debug

Timebase Source: SysTick

5.5. TIM2

Combined Channels: Encoder Mode

5.5.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**65534 ***
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable

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)

Encoder:

Encoder Mode	Encoder Mode TI1
____ Parameters for Channel 1 ____	
Polarity	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter	0
____ Parameters for Channel 2 ____	
Polarity	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter	0

5.6. TIM3

Combined Channels: Encoder Mode

5.6.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**65534 ***
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable

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)

Encoder:

Encoder Mode	**Encoder Mode TI1 and TI2 ***
____ Parameters for Channel 1 ____	
Polarity	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter	0
____ Parameters for Channel 2 ____	
Polarity	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter	0

5.7. TIM4

mode: Clock Source

5.7.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**63 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**5000 ***
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable

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)

5.8. TIM5

Channel3: PWM Generation CH3

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
auto-reload preload	Disable

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 (16 bits value)	0
Fast Mode	Disable
CH Polarity	High

5.9. TIM8

Channel1: PWM Generation CH1
Channel2: PWM Generation CH2

5.9.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**63 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**999 ***
Internal Clock Division (CKD)	No Division
Repetition Counter (RCR - 8 bits value)	0
auto-reload preload	Disable

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

5.10. USART1

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

*** 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	PC1	ADC1_IN11	Analog mode	n/a	n/a	SENSOR2
	PC2	ADC1_IN12	Analog mode	n/a	n/a	SENSOR3
ADC2	PB1	ADC2_IN9	Analog mode	n/a	n/a	BATTERY
ADC3	PC0	ADC3_IN10	Analog mode	n/a	n/a	SENSOR1
	PC3	ADC3_IN13	Analog mode	n/a	n/a	SENSOR4
TIM2	PA0-WKUP	TIM2_CH1	Input mode	No pull-up and no pull-down	n/a	ENCODER_RIGHT1
	PA1	TIM2_CH2	Input mode	No pull-up and no pull-down	n/a	ENCODER_RIGHT2
TIM3	PA6	TIM3_CH1	Input mode	No pull-up and no pull-down	n/a	ENCODER_LEFT2
	PA7	TIM3_CH2	Input mode	No pull-up and no pull-down	n/a	ENCODER_LEFT1
TIM5	PA2	TIM5_CH3	Alternate Function Push Pull	n/a	Low	BUZZER
TIM8	PC6	TIM8_CH1	Alternate Function Push Pull	n/a	Low	MOTOR_LEFT_PWM
	PC7	TIM8_CH2	Alternate Function Push Pull	n/a	Low	MOTOR_RIGHT_PWM
USART1	PA9	USART1_TX	Alternate Function Push Pull	n/a	**High ***	
	PA10	USART1_RX	Input mode	No pull-up and no pull-down	**n/a**	
GPIO	PC4	GPIO_Output	Output Push Pull	n/a	Low	IFLED4
	PC5	GPIO_Output	Output Push Pull	n/a	Low	IFLED3
	PB0	GPIO_Output	Output Push Pull	n/a	Low	IFLED2
	PB10	GPIO_Output	Output Push Pull	n/a	Low	IFLED1
	PC8	GPIO_Output	Output Push Pull	n/a	Low	MOTOR_LEFT_IN1
	PC9	GPIO_Output	Output Push Pull	n/a	Low	MOTOR_LEFT_IN2
	PA11	GPIO_Output	Output Push Pull	n/a	Low	MOTOR_STBY
	PA12	GPIO_Output	Output Push Pull	n/a	Low	MOTOR_RIGHT_IN2
	PC10	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	SW2
	PC11	GPIO_Output	Output Push Pull	n/a	Low	MOTOR_RIGHT_IN1
	PB5	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	SW1
	PB6	GPIO_Output	Output Push Pull	n/a	Low	SENSORLED1
	PB7	GPIO_Output	Output Push Pull	n/a	Low	SENSORLED2

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
Prefetch 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
ADC1 and ADC2 global interrupts	true	0	0
TIM4 global interrupt	true	0	0
USART1 global interrupt	true	0	0
TIM8 break interrupt	true	0	0
ADC3 global interrupt	true	0	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
TIM2 global interrupt	unused		
TIM3 global interrupt	unused		
TIM8 update interrupt	unused		
TIM8 trigger and commutation interrupts	unused		
TIM8 capture compare interrupt	unused		
TIM5 global interrupt	unused		

*** User modified value**

7. Power Consumption Calculator report

7.1. Microcontroller Selection

Series	STM32F1
Line	STM32F103
MCU	STM32F103RETx
Datasheet	14611_Rev12

7.2. Parameter Selection

Temperature	25
Vdd	3.3

8. Software Project

8.1. Project Settings

Name	Value
Project Name	Culverton
Project Folder	C:\Users\sh4869\Documents\SRDC\Culverton\Program
Toolchain / IDE	Makefile
Firmware Package Name and Version	STM32Cube FW_F1 V1.6.0

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